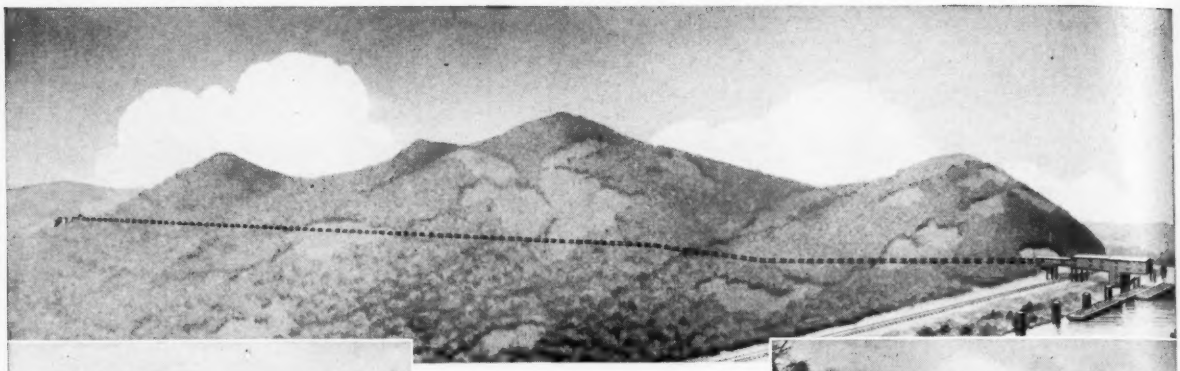
Mining CONGRESS JOURNAL

OCTOBER 1950



TWO MILES IN ONE FLIGHT!

Here coal is prepared in this new blending and washing plant completely designed and built by Link-Belt. From this plant the washed coal is delivered to the tunnel belt conveyor (right side of above photograph) on which it is transported to the river and rail loading station.

River and rail loading station also built by Link-Belt Company where washed coal is loaded into barges, or by means of a by-pass conveyor, into railroad cars.

World's Longest Single Belt Conveyor

Through a mountain, under forests, roads and streams this single 30" wide belt conveyor transports coal from preparation plant to river and rail loading station—10,900 ft. from foot pulley to head pulley—more than four miles of belt operated by one drive!

After careful analysis of various methods of transportation ultimate economy dictated the selection of this belt conveyor. By building this conveyor in one flight, intermediate transfers, heavy machinery and power wiring were eliminated from the tunnel.

Link-Belt Company engineered, equipped and erected the blending and washing plants, the conveyor equipment and the river and rail loading station. Resulting success of this and other similar projects illustrates the importance of such coordinated effort.

Typical cross-section through tunnel showing belt conveyor and battery driven patrol car. Standard Link-Belt type "100" idlers are used throughout the 2-mile long belt conveyor.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices in Principal Cities.

11.944-A

LINK-BELT

Belt Conveyor

EQUIPMENT

IDLERS • TRIPPERS • BELTS
PULLEYS • BEARINGS • DRIVES

Capacity means nothing when your loader is down

We at Myers-Whaley have devoted our entire engineering ability to building loading machines exclusively for over 40 years. We believe we know the requirements that make mechanical loading effective and profitable. These requirements have been built into the Whaley "Automat." Along with low power consumption . . . safe operation, we have big capacity. But capacity means nothing when your loader is down. Most important, we have built into the Automat *vitality* . . . *endurance* . . . and *ability to stay on the job.*

The simplicity of the "Automat" is your guarantee of more consistent loading, in any class of materials, hour after hour every day, week-in, week-out.

Write for our new Catalog 250 giving you every detail of this fine machine. Myers-Whaley Co., Knoxville, Tenn.

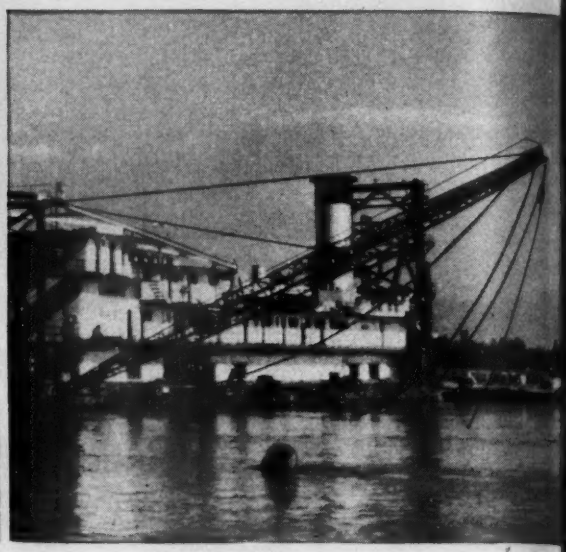
MYERS-WHALEY

"MECHANICAL LOADERS EXCLUSIVELY FOR OVER 40 YEARS"

FOR JOBS LIKE THESE...

You've got to have a rope with guts

HIGH, WIDE AND HANDSOME. Quarries need wire rope that will run fast, support tremendous weight. This photograph shows TIGER BRAND Wire Rope used for derrick and mast guys, and hoisting ropes, in a nationally-known quarry.



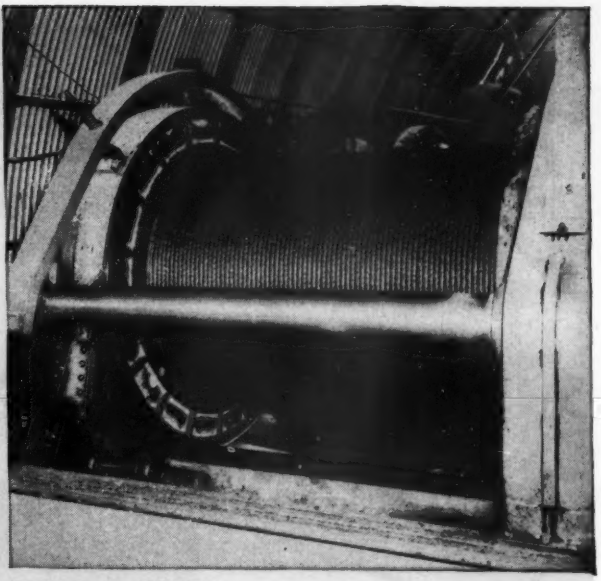
WET AND MUCKY. TIGER BRAND Wire Rope furnishes the muscles for this big Mississippi dredge. Constantly in and out of water . . . subjected to extreme loads . . . TIGER BRAND delivers economical heavy-duty service that pays off in fewer rope replacements.

A ROPE'S TOUGHEST DIGGING JOB. Dust and grit spell short life for inferior rope—if it's used in strip mining. But you can count on TIGER BRAND Wire Rope to give matchless performance under the toughest operating conditions.

TIGER WIRE ROPE SLINGS

We can furnish a complete line of 8, 6, 4-part and laid slings as well as all standard and special wire rope fittings. Choose from our standard selection or, if you have a special problem, we'll make special slings to your specifications. Write for our free booklet, "American Tiger Wire Rope Slings."

OUT GOES THE OVERBURDEN. Stripping overburden usually means high shock stresses on the rope. TIGER BRAND Wire Rope—made in the widest variety of styles—is available to meet unusual conditions of shock . . . abrasion . . . high loads.



READY FOR A WORKOUT. TIGER BRAND Wire Rope has the flexibility to withstand constant coiling and uncoiling. When properly lubricated and maintained, TIGER BRAND Wire Rope will give you dollar for dollar service that can't be beat by any other wire rope.

FOR HIGH STRENGTH, GREAT FLEXIBILITY AND A COMPLETE RANGE OF SIZES AND STYLES—USE

TIGER BRAND WIRE ROPE

Judge it by the jobs it handles!

Most premature rope failures can be traced to improper selection, maintenance or installation.

Your TIGER BRAND field service engineer can help you with all these problems. A skilled engineer, he has access to a tremendous file of case histories. He knows how to pick the *best* kind of wire rope for your own job—the type of core, the kind of steel, the construction, the lay and the finish—all things that must be considered for top performance.

Your TIGER BRAND field service engineer will do more than help you select the rope. He'll show you how to use it most effectively with your running equipment. He might, for example, suggest that you use:

MANGANESE STEEL SHEAVES TO INCREASE ROPE LIFE

Soft steel sheaves can cause trouble. Tiny slivers of metal become imbedded in the rope and "grind" it until it fails. Furthermore, the rope will cause corrugations in the sheave. In turn, these corrugations can ruin the rope that caused them. Manganese steel sheaves actually harden and polish themselves under severe pressure and friction. So they continuously present a smooth surface to the rope—and lengthen its life.

If you have a special application that's tough on wire rope, get in touch with your TIGER BRAND field service engineer. Meanwhile, you'll find a wealth of knowledge in our information-packed handbook, "American TIGER BRAND Wire Rope." Write for it today.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
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USS TRADE MARK

AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

Kennametal Bits

for Lowest Cost Bolt Hole Drilling in *Any* Roof

These are a trio that can add new drilling speed to your bolt drilling job. There's one to save money on drilling time OVER ANY OTHER BIT. Regardless of your roof condition, there's a Kennametal Bit to drill FASTER and at less cost.

The RD Style drills better and lasts longer in boney, shale, and slate than conventional Kennametal coal bits. Its strong, stubby prongs, tipped with extra thick Kennametal cemented carbide gives long service life on HARD roof jobs. For drilling HARDER roof, like hard shale and slate, laminated sandstone, etc., the FD series drill offers maximum drilling power. While not as fast as the RD Style, it operates 20% to 30% faster than percussion drills. Either the RD or the FD series can be used on standard coal drills. Your Kennametal representative has many suggestions on mounting that he will be glad to give you FREE.

The PA series drills the hardest material like massive sandstone and limestone roof. Because of its single blade construction, it drills 10% to 20% faster than other percussion type bits.

Remember the Kennametal BIG 3 in your next bolting plans. They can save you money on drilling time OVER ANY OTHER BIT. Plan now to call a Kennametal representative in when you start to bolt up. He will be glad to give you the benefit of his specialized experience. He will also be glad to demonstrate—to make sure you have the BEST bit—SPEED, COST, and JOB considered—that your money can buy.

Contact him by writing — Mining Division, Kennametal Inc., Latrobe, Pa.

- **Less Bit Changing**
- **Lower Bit Cost**
- **Easier Drilling**
- **No Hole Taper**
- **More Secure Bolts**

New Roof Pinning Rod for FD and RD Rotary Series

KENNAMETAL.®

Drill Bits • Machine Bits • Strip Bits • Rock Bits

Kennametal Inc., Latrobe, Pa.

Please send me FREE fully-illustrated Kennametal Folder M-105 that shows 21 different sizes of three different drill styles and complete details on how to get lowest possible roof drilling cost.

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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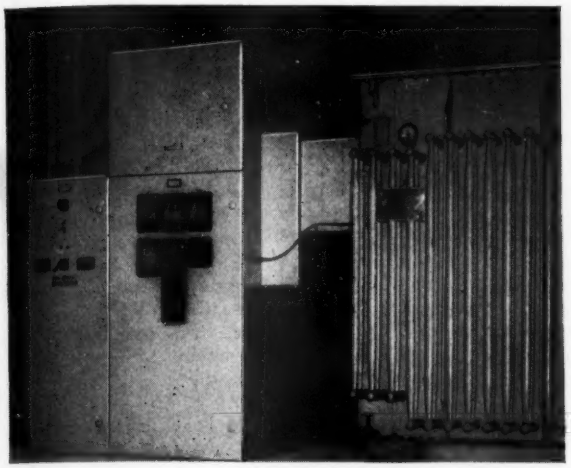
Member Audit Bureau of Circulations

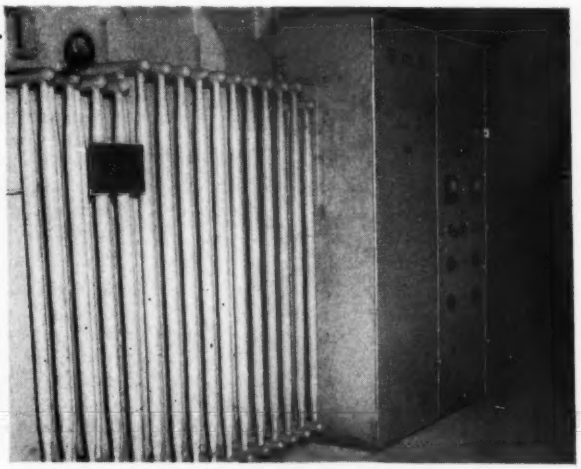
Island Creek saves 3 ways with G-E Rectifier!

Mercury-Arc Rectifiers –to cut mining costs!

Installation costs cut! In installing this G-E 300-kw mining-type rectifier, Island Creek Coal Co. saved an estimated $140 by eliminating special foundations, cable ducts, etc. needed with rotating converters. Completely automatic in operation, G-E rectifiers can be placed in remote locations, without constant attendance. Use of shorter d-c lines is made possible, and voltage drop is reduced

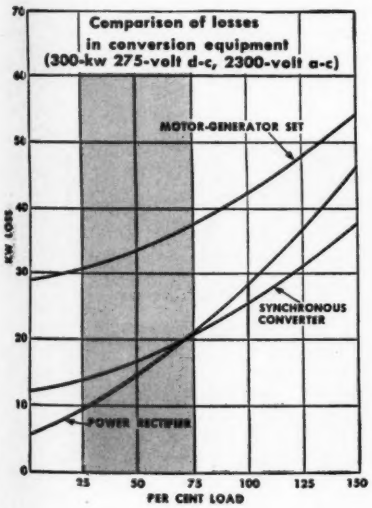
General Electric mining-type rectifier at Island Creek Coal Co., Holden, W. Va., saves an estimated $220 power cost and $250 maintenance cost every year—plus installation savings of $140!





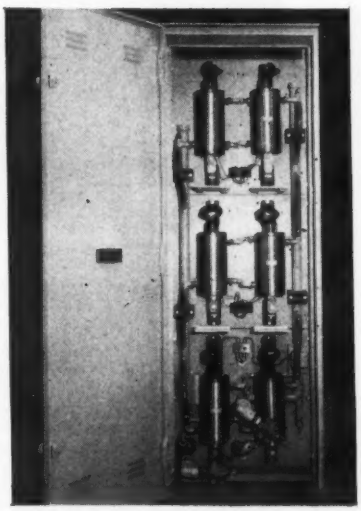
Personnel protected! To minimize the possibility of personnel coming into accidental contact with live parts, all units are deadfront, completely metal enclosed. Shown above are incoming a-c switchgear section and part of power transformer section. (At right: Rest of power transformer section, plus rectifier section and d-c switchgear section.)

Downtime reduced! A G-E rectifier has no major rotating parts to wear and interrupt service for replacement or cleaning. Protective devices automatically trip it off in case of a fault, minimizing downtime caused by damage to equipment. With full voltage at the face, mining machines operate more efficiently, with fewer interruptions.



Power costs cut! (left) Average mining load varies from 25 to 75 per cent of the conversion equipment's rating. In this range, as chart shows, power rectifiers have higher conversion efficiency than rotating machines. Island Creek Coal Co. estimates power savings at $220 annually from one G-E 300-kw rectifier alone.

Maintenance costs cut! (right) Steel panels isolate firing circuits from tubes and water cooling system, protecting electrical components. Rectifier unit has easily accessible parts, needs only an infrequent tube replacement and addition of water in the cooling system. Island Creek Coal Co. calculates its maintenance savings at $250 per year on one G-E rectifier.

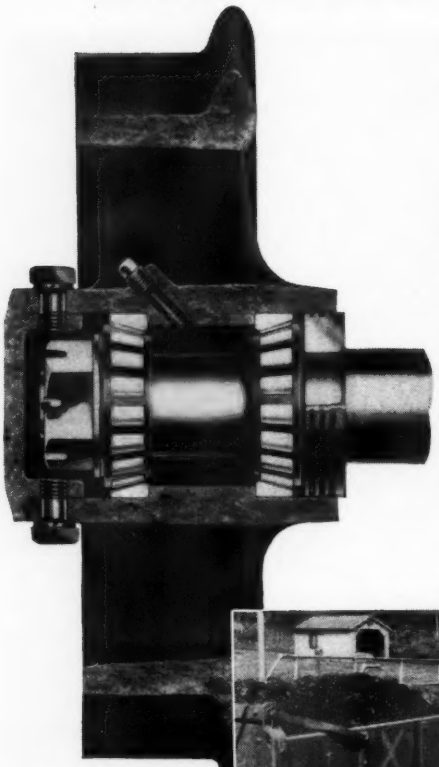


SERVICE-PROVED! Over 250 G-E sealed tube mercury-arc rectifiers for mining service, in both stationary and portable types, are now in use throughout the country, some for more than 12 years. For more detailed information, write for new bulletin GEA-4047, or check with your nearest G-E office. *Apparatus Dept., General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

663-10

Why more than half a million mine cars have rolled on TIMKEN® bearings



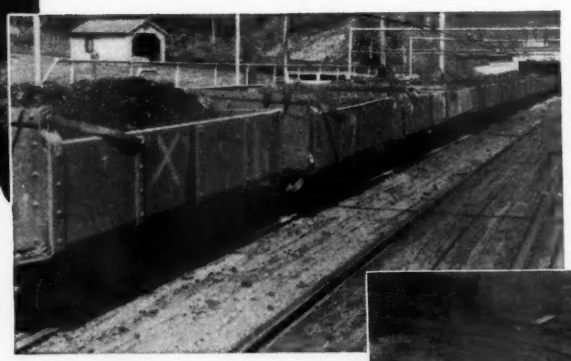
THROUGHOUT the United States, over 500,000 mine cars have been equipped with Timken® tapered roller bearings to insure long bearing life and trouble-free performance. Many of these cars are more than twenty years old and the original bearings still have years of service ahead of them.

Due to the line contact between rollers and races, Timken bearings have tremendous load-carrying capacity—have the rugged strength required for rugged service. Tapered design permits Timken bearings to take both radial and thrust loads in any combination — eliminates the need for extra thrust bearings or thrust plates. Timken bearings reduce friction to a minimum; easier starts and higher speeds are possible. Train lengths can be greatly increased.

Long bearing life is assured with periodic lubrication. All makes of bearings, including Timken, must be regularly lubricated for maximum bearing life.

No other bearing gives you all the advantages you get with Timken bearings. Be sure the mine cars you buy are equipped with Timken bearings—and look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



STILL GOING STRONG after more than 20 years, these cars, part of the 660 Timken bearing equipped cars at Consolidation Coal Company (W. Va.) Mine 63, Monongah, West Virginia are still moving maximum tonnage at minimum expense on Timken bearings.

MORE THAN TWENTY YEARS ago, these Timken bearing equipped cars went into service at the Castle Shannon Coal Company in Cloverdale, Pennsylvania. Part of a group of 526, they have been rebuilt several times—but the original Timken bearings are still on the go.

POSITIVE ROLLER ALIGNMENT

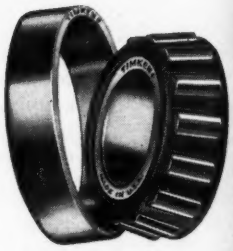
Wide area contact between roller ends and rib of the cone prevent Timken rollers from skewing. Result: bearings roll easier, last longer.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

ALLIS-CHALMERS

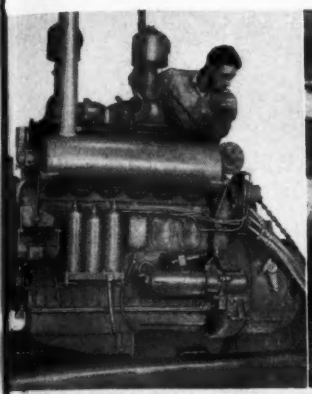
Design Simplicity

Another Big Reason Why HD-19 Leads in Tractor Output

Gears, pinions and bearings by the dozen have been eliminated in the HD-19. This means fewer parts to wear — fewer breakdowns and fewer repair bills.

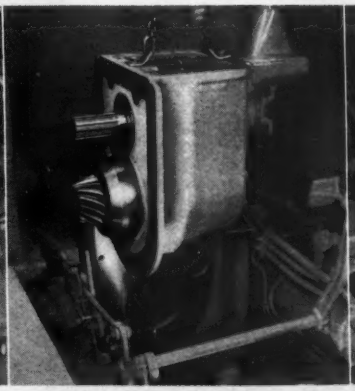
When maintenance is necessary, each assembly is readily accessible for attention. The HD-19 is designed so that each major unit may be easily removed and repaired or replaced *right on the job* without removing unrelated parts. The time and labor saved means substantial increases in the HD-19's over-all output. Remember, a tractor makes money for an owner only when it's working.

Simple unit assembly is another important reason why the HD-19 is low in total down time required for servicing and maintenance . . . why it is tops in output per day, per month, per season.



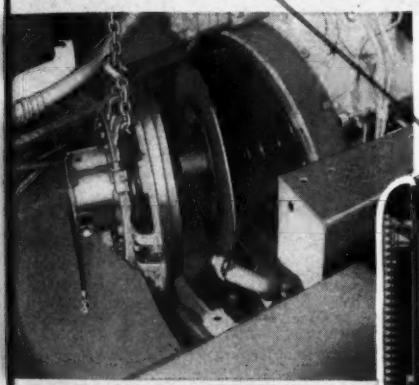
Engine can be removed without disassembling clutch.

Torque converter can be removed without disturbing engine or transmission.

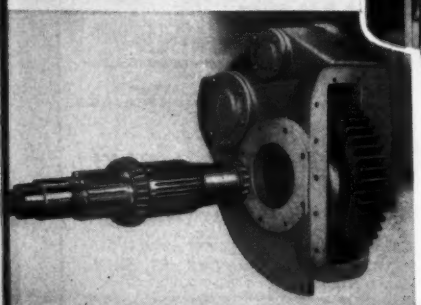


Transmission can be removed as a complete unit without removing clutch, final drive or bevel gear.

Each steering clutch can be removed independently and without disturbing final drive or bevel gear.



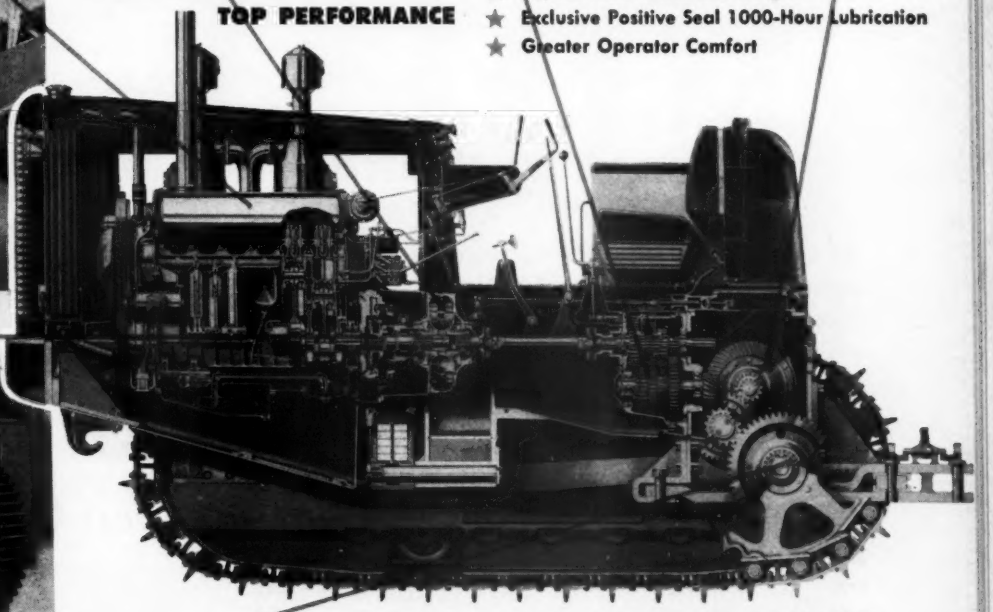
Clutch assembly can be removed without disturbing either engine or transmission.



Final drive gear and intermediate gear can be removed without disturbing steering clutch.

MORE REASONS FOR HD-19 TOP PERFORMANCE

- ★ Torque Converter Drive
- ★ 40,000 lb. of Balanced Weight
- ★ Exclusive Positive Seal 1000-Hour Lubrication
- ★ Greater Operator Comfort



. . . For Greater Production

. . . For Easier Operation . . . For Simplified Servicing

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

AMERICAN PERMISSIBLE EXPLOSIVES . . . for any seam of coal

FOR EITHER MECHANICAL OR HAND LOADING

NON-GELATINOUS

Fast	Medium	Slow
American 22	American 11	American 1
American 23	American 12	American 2
	American 12A	American 3A
	American 14A	American 4A
	American A	American 5

GELATINOUS

Permigel 1 — Permigel 2A
Permigel 3 — Permigel 4
Blasting Powder . . . . . Granular
Blasting Powder . . . . . Pellet

As a result of intensive research, close chemical control and unremitting care in manufacture, the AMERICAN list of permissibles provides an explosive exactly fitted for the most effective use in any seam —for either hand or mechanical loading. With a complete range of velocities and densities, the list of AMERICAN Explosives includes one exactly suited to *your* blasting requirements.

AMERICAN Explosives have been thoroughly proven through many years of service in representative coal mines. You can *count* on them! And you can count on prompt delivery service, too—from well-located plants and distributing points. Always specify "AMERICAN".

Capable Field Engineers are Available at Your Call

★ High Explosives ★ Permissibles ★ Blasting Powder ★ Blasting Accessories

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EXPLOSIVES DEPARTMENT
30 ROCKEFELLER PLAZA • NEW YORK 20, N. Y.

Sales Offices: Pittsburgh, Pa. • Bluefield, W. Va. • Scranton, Pa. • St. Louis, Mo. • Chicago, Ill. • Pottsville, Pa. • Hazleton, Pa. • Maynard, Mass.

Don't Guess!

DETERMINE YOUR ROOF BOLT Anchorage Easily--Quickly WITH THE CONTINENTAL MODEL BT-252 Roof Bolt Pull Tester

The Model BT-252 Roof Bolt Pull Tester in action. Notice direct pull reading in tons on gauge and measurement of bolt displacement.

• RUGGED • PORTABLE • ACCURATE
CAPACITY 25 TONS
For use with ⅝"—¾"—⅞"—1" Bolts
Gauge Dial Calibrated in Tons
No Special Test Bolts Required

A glance at the dial on the Continental Roof Bolt "Pull Tester" will show whether your roof bolts are anchored and will hold the load desired.

A MUST FOR SAFETY CONTROL IN ANY BOLTED MINE

This New Continental DRILLRAM Does All the Work

This Self-Propelled completely electric DRILLRAM with Hydraulic feed—the latest in Roof Drills—saves labor and time. Completely mobile. Try it in your mine!

"Always specify Continental Conveyors"

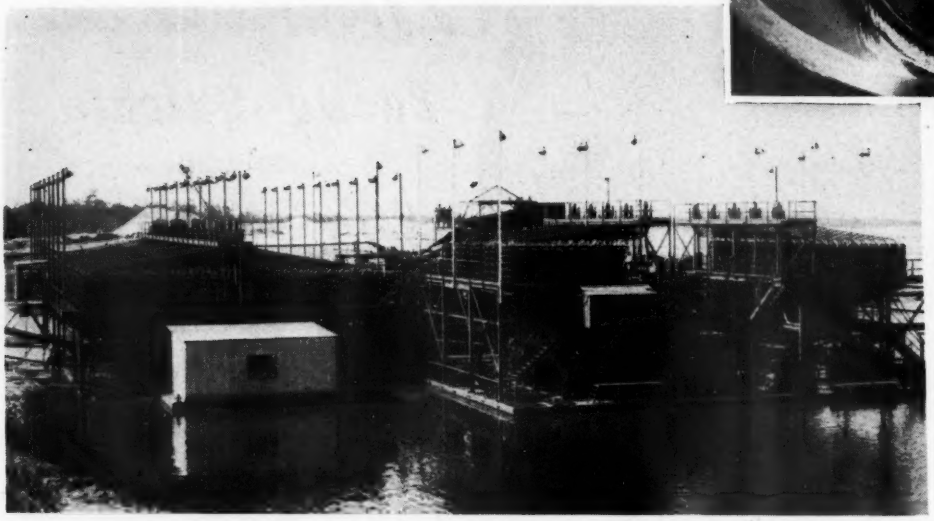
INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

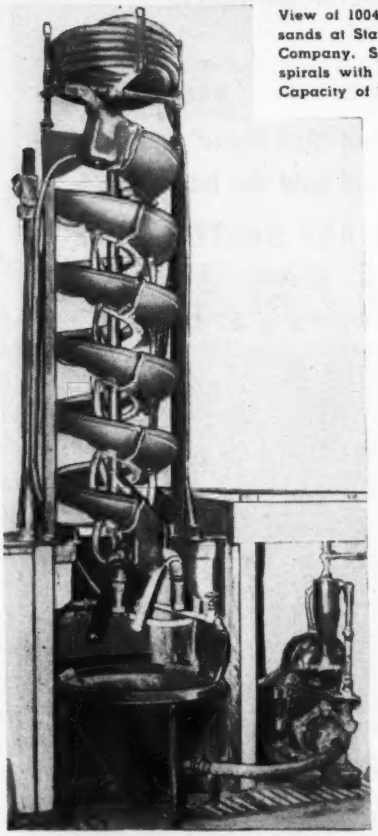
HUMPHREYS SPIRAL CONCENTRATOR

Low cost of installation • Low operating costs
No moving parts

Concentrating action Humphreys Spiral.—Note wide black band of concentrate entering upper outlet, which is set for a wide cut, also narrow black band of middling entering lower outlet set for thin cut. In cleaning fine coal, refuse and middling are discharged from the concentrate ports and cleaned coal follows the path shown as tailing above.



View of 1004 Humphreys Spiral Concentrators used for recovery of ilmenite, rutile and zircon from beach sands at Starke, Florida mine operated by Humphreys Gold Corporation for E. I. du Pont de Nemours & Company. Spirals are mounted on barges floating in dredge pond, one barge supporting 704 first stage spirals with pumps, another barge supporting 200 second stage and 100 third stage spirals with pumps. Capacity of 704 rougher spirals is 1100 tons per hour original feed.



Closed circuit test unit utilizing a full size spiral concentrator in Denver testing laboratory.

- ✱ *for* separation of minerals of different specific gravity in ores at sizes generally minus 10 mesh.
- ✱ *for* cleaning minus ¼ inch bituminous or anthracite coal.
- ✱ *for* recovery of liberated values too coarse for flotation.
- ✱ *for* recovery of values too fine to be economically treated by heavy-media separation.

HUMPHREYS SPIRALS have been used in full-scale plant operation for concentration of chromite, rutile, ilmenite and zircon from sands; for concentration of ground ores for recovery of lead and zinc; for concentration of molybdenum flotation mill tailing for recovery of tungsten; for concentration of fine iron ore; for separation of fine phosphate rock from sand; for cleaning minus ¼ inch coal; for concentration of pyrite from flotation mill tailing; for concentration of fine gold and gold bearing minerals; and for recovering mica and barite.

The installation, operating and maintenance costs of Humphreys Spirals are so low that economical concentration of materials which could not heretofore be worked at a profit, is now possible. There are no moving parts, no vibration, weight per unit of capacity is light and requires only a light foundation. Floor space per ton treated is very small.

A testing laboratory is maintained in Denver by the Engineering Division of the Humphreys Investment Co. Results obtainable in a full size plant may be determined by tests of a representative sample of minerals or coal weighing 300-500 lbs.

THE HUMPHREYS INVESTMENT COMPANY

Engineering Division

918 FIRST NATIONAL BANK BUILDING • DENVER 2, COLORADO

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AUSTRALIA: John Carruthers & Co. Pty. Ltd., Edgecliff
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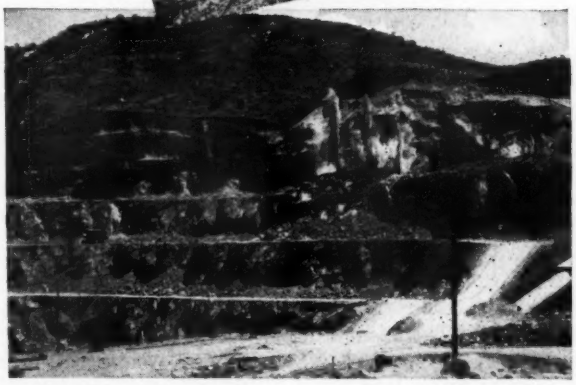
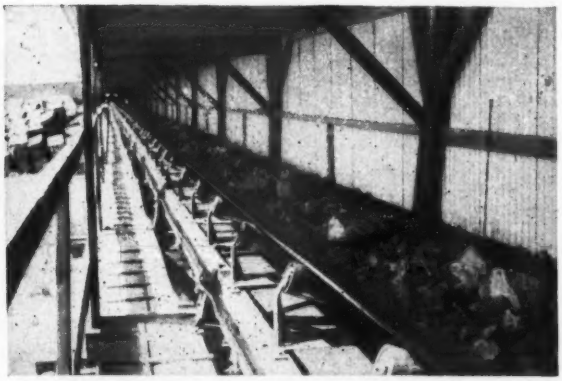
NYLON MAKES NEW BELT UP TO 250% STRONGER

Also provides more flexibility... easier training... carries heavier tonnage... is easier to repair

HERE A 2,300 FOOT cotton-nylon belt system is moving more than 700 tons of ore per hour. Use of nylon in combination with cotton yarns makes possible a greater number of fabric plies which increases overall belt strength by as much as 250 per cent.



THE SERVICE REQUIRED of conveyor beltings in this mining region demands a thick belt with great elasticity and high abrasion resistance. Despite its thickness this "U. S." Belt has greater flexibility, to conform more easily to path and contour of idler pulleys. This increases tonnage, reduces spillage.



KNOWN AS STYLE YN, this belt has been specially designed to accelerate the ever-expanding scope of mechanization, making possible longer centers and higher lifts resulting in ever-increasing economies. In speed and facility of repairs this belt is unequaled in its class.

If you have any problem involving conveyor belting, talk it over with our engineers. They will gladly work with your own men in advising, planning or executing any job. Write Mechanical Goods Division, U. S. Rubber Company, Rockefeller Center, New York 20, N. Y.

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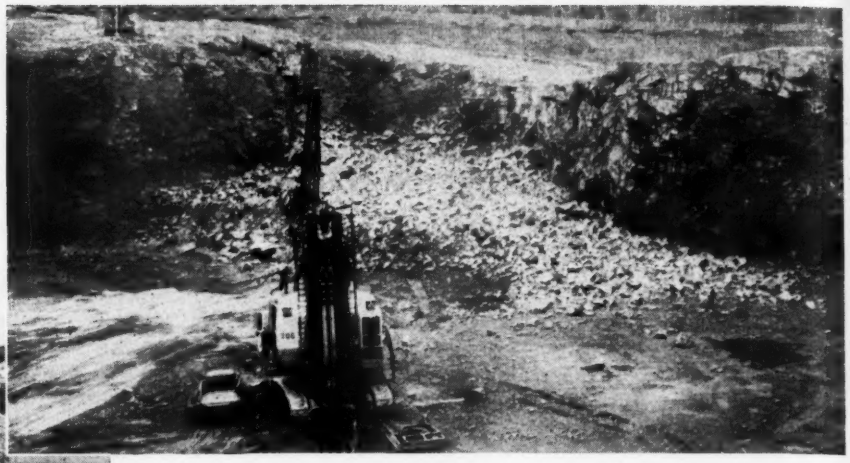

Face showing loading operation. Drill holes approximate 85 feet, 9¼ inches in diameter. Burden averages 21.5 feet, spacing 26 feet.

DAY-TO-DAY BLASTING PROVES ECONOMY OF DU PONT "Nitramex" No.2

Helps improve fragmentation . . . reduce secondary blasting

Close-up of typical loading operation. "Nitramex" No.2, especially developed for bottom loading, gives additional strength needed to break hard-rock toe.

Wires are attached to Du Pont Blasting Timer set at .020 interval. Rotational firing creates a peeling action that reduces vibration and improves fragmentation. Secondary blasting is held to a minimum.

Operators of the Benson open pit Magnetite iron ore mine of the Jones and Laughlin Ore Co., Star Lake, N. Y., are using Du Pont "Nitramex"* No.2 in routine blasting operations. Their experience has proved the economy and efficiency of this blasting agent for better fragmentation and reduced secondary shooting.

The effective blasting plan adopted for a typical and difficult toe condition calls for bottom loading of "Nitramex" No. 2. This new-type blasting agent readily breaks up tough bottom rock. Its high density and slow pressure development result in a powerful spreading action . . . permit increased spacing, reduce drilling and blasting costs.

"Nitramex" No.2 retains all the safety characteristics of Du Pont "Nitramon."** It cannot be detonated by friction, falling objects, or even the impact of ball ammunition. But like "Nitramon," it is dependably detonated with a "Nitramon" Primer, itself relatively insensitive.

The remainder of an average load consists of Du Pont "Nitramon" and "Nitramon" Primers connected by Primacord and detonated with Du Pont Electric Blasting Caps. Split-second blasts, with the Du Pont Blasting Timer set at intervals of .020 second, peel the rock from the face, giving excellent fragmentation.

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*Reg. trade-mark for ammonium nitrate blasting agent
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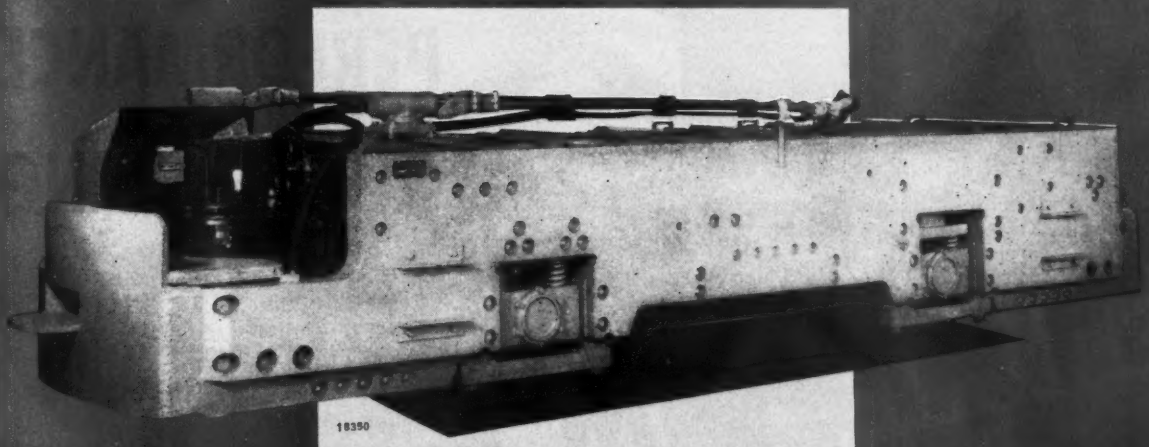
HEAVIER LOCOMOTIVES and HIGHER SPEEDS for MAIN LINE HAULAGE in METAL MINES



GOODMAN TROLLEY LOCOMOTIVES

The locomotive shown here weighs 20 tons and has two motors, 120 hp. each. Speed at running drawbar pull is 8 miles per hour. Over-all length—20 feet 4 inches, height over deck—44½ inches, over-all width—63 inches. Air brakes, sealed beam headlights and roller axle journal bearings are other features. It can be operated in permanent or separable tandem.

This locomotive is one of a fleet built for a large metal mine. Can we give you more details about it or other locomotives available in the complete Goodman line?

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In Great Britain: The Distington Engineering Company, Ltd.

PERFORMANCE ✓OUTSTANDING

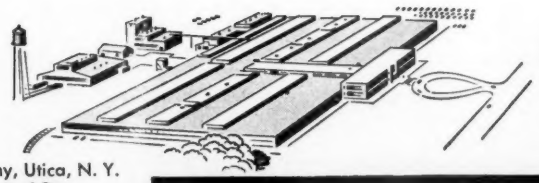
Here's a new sinker—the CP-59—that outperforms any other drill in its class (55 pounds). It has remarkably high drilling speed . . . exceptionally strong rotation . . . unsurpassed hole cleaning . . . excellent riding qualities.

Its design incorporates all the factors that make for fast, efficient, economical operation.

Low maintenance is assured by such features as a replaceable bronze chuck rotation nut to protect piston splines from scoring and a replaceable bronze cylinder bushing liner to make it easy to maintain piston alignment and full cushioning.

The CP-59 is equipped with a 4-in-1 backhead. Rapid and inexpensive changeovers make possible plain dry, blower dry, plain wet or air-wet operation.

Have your nearest CP dealer give you a demonstration of this outstanding drill, or write for a copy of SP-3009.



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This Bucyrus-Erie 1050-B stripping shovel is now in its eighth year of service in an Illinois coal mine, and has established consistently outstanding production records in millions of yards moved every year. In overburden averaging 45 feet in depth, with a maximum of 80 feet, the 1050-B is on the job three eight-hour shifts daily, every day in the week.

It is dependable high output like this that makes Bucyrus-Erie stripping shovels and draglines first choice wherever high overburden ratios threaten economical coal recovery. Their range, capacity, speed and reliability come from the *years ahead* design made possible by Bucyrus-Erie's unequalled experience in the design and construction of excavating machinery of all sizes and types.

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and here's another RB advantage you'll like

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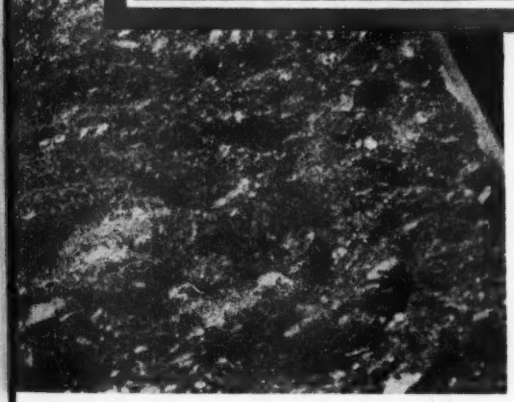

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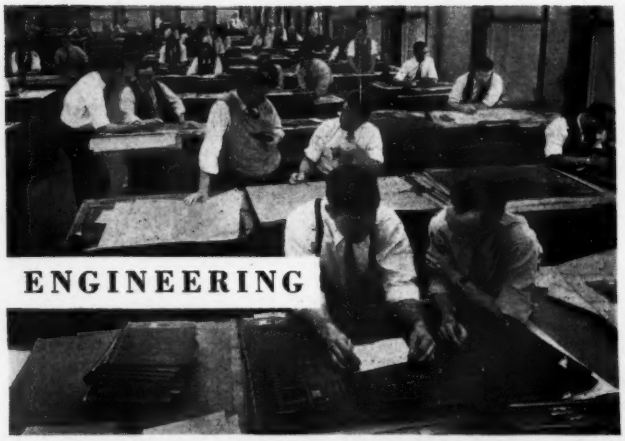

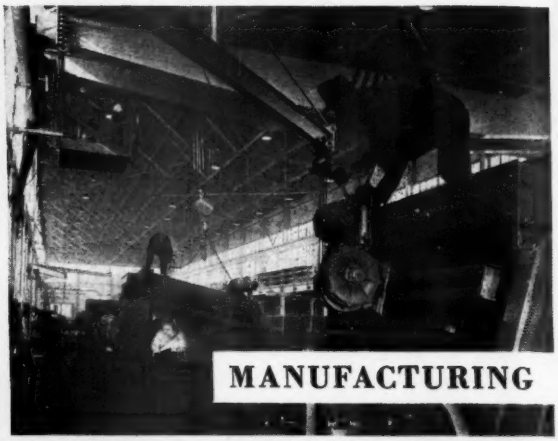

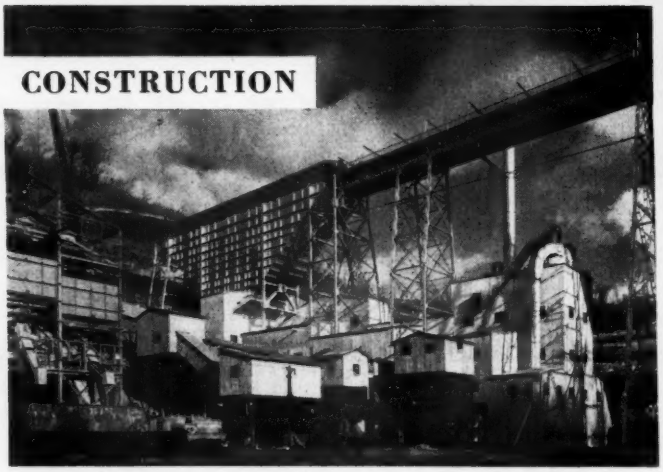

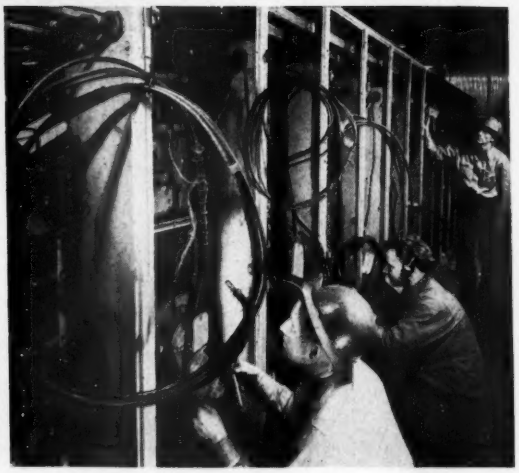

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Editorials

JOHN C. FOX, *Editor*

October, 1950

Mobilization and Manpower

TO provide armament for this nation and our allies, a strong, well supplied manufacturing industry is needed. To mining goes the task of providing the basic raw materials and the bulk of the energy required. The entire industry is ready and willing to carry out this assignment.

But mineral production is based on manpower. To boost output it will be necessary to increase the total number of man-hours available. Extension of the work week from forty to forty-eight hours would boost the hours each man could work by twenty percent. Unfortunately, a man can't put any rock in the box, whether the work week is five or six days long, when he is out toting a gun. If skilled miners, trained maintenance men and competent mill hands are to be utilized to best advantage, the errors of World War II must not be repeated. Key men, trained in safe and efficient performance of the highly specialized jobs in mines and treatment plants, must be kept on the job where their talents will best serve the defense effort.

Major segments of the mineral industry are faced with labor shortages. The urgent pleas in western mining areas for competent workmen are ample evidence of that.

A study prepared for the recently organized Coal Defense Committee shows that, under conditions of total mobilization, the bituminous coal industry would suffer a loss of 61,000 men to the armed services, leaving a work force of only 314,000. But to produce the 500 million tons estimated minimum coal requirements, 332,000 to 409,000 men would be needed, depending on the number of days actually worked during the year. Thus a serious shortage of men to produce our most basic source of industrial energy and domestic heat might readily eventuate unless due care is exercised.

Consider the training period necessary before a recruit can qualify as a miner. In underground metal mining for instance, the new man is assigned first to the labor gang. After several weeks, or months, of operating a muck stick he may be promoted to the rank of timberman's helper. Then he may graduate to driller's helper, where his apprenticeship may last for a considerable further period before the recruit is a miner. The training to prepare a man for the responsibilities of modern mechanized coal mining is likewise long and exacting.

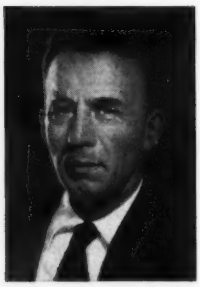
History tells us that skillful hands and close cooperation are necessary for maximum production in any large-scale work and this is especially true in mining. The stope or face crews must coordinate their activities with the haulage schedule. This, in turn, must dovetail with the requirements of the washery or beneficiation plant. Key personnel must be well trained, steady and dependable or production and safety will suffer.

Before manpower in mining was to some degree stabilized by deferments during World War II, a large number of capable miners were lost to the industry. The task of supplying the basic raw materials and coal necessary to the war effort could have been carried out so much better had the experienced miners been kept at work from the beginning.

It is hoped that those who set up and administer the machinery for mobilization of manpower in the present emergency will profit by these lessons.

What Is the Future of Gold?

A Realistic Approach to Decontrol of Gold and a Warning Against Bureaucratic Power Usurpers



Hon. HARRY P. CAIN
U. S. Senator, Washington

FOUR months have passed since the carefully trained and secretly mobilized legions of communism erupted across the 38th parallel in Korea. During that brief period this country and the entire community of peaceful nations have been subjected to a series of unparalleled shocks. Unprovoked aggression, accompanied by the flaming violence of tanks and heavy ordnance is always a jolt to men who believe in law and order, in peace and equity, in the just precepts of religion and in the fair progress of a free society.

It is no exaggeration to say that great shocks were reserved for Americans. In the first place, the assault of the red marauders came as a complete surprise to a government which had spent billions of taxpayers' hard earned income to create a military establishment able to protect this country against aggression. Recent events demonstrate that our intelligence was defective—to use the most charitable word—that the military power on which so much has been spent was not able to discipline and destroy the predatory division of a third rate power.

Some cherished illusions have suffered. The notion that air power alone could defeat the most powerful foe must be revised. The naive faith that a huge output of fuel, an enormous capacity to produce steel, aluminum, automobiles and food could take the place of trained troops and eliminate the need for armored divisions, must be abandoned. The simple notion that a high living standard constitutes an automatic roadblock against the deadly thrusts of a ruthless ideology must join the great fallacies of history.

It is certain that antagonists of the future will read the record and profit by it. The United States will not always be fortunate enough to have an enemy who considerately gives due warning and obligingly waits until this nation's great industrial capacity provides the weapons and material to defeat him. Nor will the great arbiter of future conflict give any credit for the billions spent on social security and soft living which should have been spent on tanks and guns.

The American public today is alarmed and disappointed. It is alarmed because the challenge to peace in violent form has come sooner than was expected. It is disappointed because the means for self defense have proven in bitter battle to be less than adequate.

In the minds of thoughtful Americans there is a deeper disturbance. There is fear—a well founded fear—that domestic institutions will be exposed to an internal corrosion as dangerous in its ultimate effect, as

Gold comes from here . . .

. . . Gold goes through here to Fort Knox

the threat posed by any external aggressor. The reference here is to the opportunity which the Korean incident gives to native planners to impose the shackles of arbitrary control upon the citizens of the United States. The record of the last 16 years shows that the planner, eager to acquire power not contemplated in the constitution and the statutes, is ready to contrive emergencies which will afford the pretext for exceptional powers. The record also shows that once these powers have been granted, a tenacious and ambitious bureaucracy is most reluctant to relinquish them. During the last war rent controls were imposed as a wartime measure. Five years after the Germans laid down their arms some of those controls were still in effect in spite of the most energetic efforts by members of Congress to repeal them.

The owners of real estate are not the only ones who have suffered from the power aspirations of our planners. Back in 1933 a succession of emergencies—some of them real—confronted this country. A variety of remedies, devised by the fertile minds of irresponsible young braintrusters, were presented to Congress with preemptory demands for their immediate adoption. It is pertinent to note that some of these urgent young men, as since proven by open testimony, owed primary allegiance to an alien power responsible for the death of American soldiers in Korea today.

Among the measures adopted during its early months to implement the "new order" was the "raw deal" in gold. Under executive order all gold in the possession of private citizens was called in to the Treasury. The solemn obligation of this government to redeem its promises to pay gold, explicitly set forth on millions of instruments, was callously repudiated. The repudiation, regretably, was subsequently upheld by a complaisant Supreme Court. In one of those cloying and hypocritical fireside chats the President of the United States averred that the action was necessary because there was not enough gold in the country or in the world to meet all the potential demands for it.

The United States was pushed off the gold standard by scheming planners. In a matter of the deepest concern to every citizen and in spite of repeated professions of solicitude for the ultimate welfare of that citizen, the government of this country was careful never to give him an opportunity to express his views on the subject. In fact the administration, which was probably already contemplating repudiation, deliberately deceived the voting public up to the very eve of the election.

Electorate Deceived

In a speech at Des Moines in 1932, President Hoover said that this country had almost been forced off the gold standard. This statement was immediately and vigorously challenged by Senator Carter Glass.

On the evening of November 4th, the Friday before election, Mr. Roosevelt undertook to reassure the voters on the question of gold. As to the possible necessity for abandoning gold, suggested by Mr. Hoover, he said "Senator Glass made a devastating challenge that no responsible government would have sold to the country securities payable in gold if it knew that the promise, yes, the covenant, embodied in these securities was as dubious as the President of the United States claims it was. Why, of course, the assertion was unsound."

In other words the voter was told late in 1932, after the bottom of the depression had already been passed, that the contesting candidate for the White House had no intention of tampering with the currency. A brief moment here has been devoted to the record for a number of reasons.

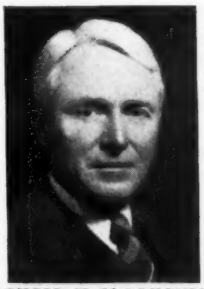
In the first place, it is necessary to recall the fact that the public has never had an opportunity to express itself directly on the issue of a sound currency.

In the second place, it was deliberately deceived by false assurances into voting for an Administration which proposed to do deviously and indirectly what it did not dare to do openly.

In the third place, the various measures adopted, sometimes explicitly but always implicitly, on the pre-

Mining and the Gold Standard

RESTORATION of the gold standard with the ratio between gold and the dollar fixed at a realistic figure which could be expected to be maintained was again advocated by the American Mining Congress.



DONALD H. McLAUGHLIN
Chairman
Gold Producers Committee,
A. M. C.

A free market for gold for a limited time, during which the level of the various paper moneys of the world would be revealed, is still felt to be a logical, effective step prior to the reestablishment of the gold standard. We subscribe wholeheartedly to the position that has been so ably expressed by the late Joseph Stagg Lawrence and by Senator Harry P. Cain. Monetary stability, on an international as well as a domestic basis, could be best obtained through following the procedures they have so clearly presented.

We desire to emphasize, however, that our dominant objective is reestablishment of a true gold standard with free circulation of gold, the interchangeability of gold and the dollar definitely established and thereafter maintained. We feel it is improbable that this could be accomplished with gold priced at $35 per ounce and are consequently most anxious to have a price set that would honestly reveal the current status of the paper currencies.

Selection of a price that was reasonably in line with current dollar and gold values would, we are convinced, greatly improve the probabilities of maintaining the gold standard once it had been reestablished. Determination of such a price would be an extremely difficult matter and we have consequently urged that it be determined in a free market. The advantages of prompt restoration of the gold standard to end the chaotic conditions which now plague the world are apparent.

To attain the desired end with less delay, we urge that a commission of qualified men be appointed by appropriate authority and given the responsibility of determining the gold content of the dollar when the gold standard is again fully established. With a commission composed of men of experience in the complexities of modern economics and finance, who were not blindly committed to the theories of managed currency and who commanded the respect of the country at large as well as of technicians and specialists, a solution might confidently be expected that would lead to the ends desired not only by ourselves but also by other thoughtful advocates of restoration of the gold standard.

mise that they were strictly temporary, are still in effect although almost a generation has elapsed since they became the law of the land.

Finally, it is desired to emphasize a wholly neglected aspect of the subtle machinations by which the money managers of the New Deal acquired their great power over the currency. Before this seizure of authority, this debauchery of the currency, could be effected, it was necessary to deny private citizens the right to own gold. It was necessary first to destroy the market for gold and prevent, under extreme penalties, the free trading in gold.

This fact requires emphasis for a special reason. There is in this country today an articulate organization of monetary scholars who have for some time been campaigning for the return of the gold standard. These men are actuated by the highest motives. They have done a splendid job in keeping alive the duty of government to protect the integrity of its currency. With all due deference for their special knowledge and exemplary intentions, I believe that these students are mistaken in urging the conversion of the dollar into gold at the rate of one ounce for every $35.

It may well be that this rate overvalued gold at the time it was fixed in the Gold Reserve Act of 1934. Actually gold was selling for approximately that price in the open London market for gold. In other words an English market in which free and willing buyers and free and willing sellers were placing values on gold was saying that the price which the American government placed upon gold early in 1934, namely $35 an ounce, was not far from its real value at the time.

Much water has gone over the dam since January 1934. A great world war has intervened. The public debt has mounted from 23 billion dollars to 256 billion dollars. The total supply of currency, that is, demand deposits and currency in circulation, is four times as great as it was when the gold equivalent of the dollar was fixed at one thirty-fifth of an ounce.

The housewife who spends a dollar today finds that it will buy just a little more than half as much as it bought at the end of 1933.

With the single exception of gold there is hardly a commodity or service which sells today for the same price that it sold for 17 years ago. It is little wonder that the use of gold for jewelry has increased during the postwar period.

The manufacturer of gold rings and watches can buy his principle raw material at a fixed prewar price. The Treasury of the United States intercedes on his behalf, compels the gold miner to sell his product at the fixed prewar price of $35 an ounce—and then passes it on at the same price to the jewelry manufacturer.

The industrial consumption of gold since the end of the war has been more than twice the domestic production. This constitutes an indefensible discrimination against the miner and an unwarranted privilege for the manufacturer.

There is no need to tell gold miners that the Treasury which grabs gold at an arbitrary price does not fix labor material and costs at the prices prevailing in January 1934.

The maintenance of a $35 price for gold is both unjust and unrealistic. It is unjust to the men who toil to produce it and are not permitted to expose their product in the open market for the best price which free bidders are willing to pay. This denial of market freedom applies to no other producer.

It is true that government does step into certain areas, notably transportation, communication and power production for the purpose of regulating rates. This is done because the nature of these industries makes competition impractical. Rates must be established with the consent of official authority to insure a fair price to the consumer.

But, wherever such a price is fixed, the statute establishing the regulatory authority is careful to direct that the rates be truly compensatory. The law, in other words, properly assures the producer the full recovery of his costs and a fair return on his capital.

There is no such statutory solicitude for the gold miner. He does not have the right, enjoyed by all unregulated producers, to take his product into the best market. Nor does he have the right, possessed by regulated producers, of recovering a price for his product which will meet his costs and give him a fair margin of profit.

This double inequity is completely alien, not only to our concepts of free enterprise, but to our basic Anglo-Saxon sense of fair play. If the government for any reason feels that a fixed price for gold is necessary as is the case in electric power, railroad transportation and the telephone, then even justice requires that a price be fixed which will cover the gold miner's costs even as utility rates are fixed at fair and compensatory levels.

On the other hand, if public policy should not require a fixed price for gold then the gold miner should have the same right enjoyed by the maker of candlesticks and mousetraps, the right to offer his product in a free market for the best price which consumers are willing to pay.

The measure of unjust discrimination to which the gold miner is exposed is illustrated by a special dispatch to *The New York Times* under the date of July 31, 1950. This story came from Tel Aviv in Israel. It reported a strong gold market with British sovereigns in active demand at $25 a piece. Since the sovereign contains less than a quarter of an ounce of gold this shows a price of more than $100 an ounce.

It was stated above that the campaign to restore convertibility of the dollar at $35 is unrealistic. It is unrealistic because it fails to take into account the sharply higher value for gold in the limited free markets which prevail in other parts of the world. It is also unrealistic because it fails to take into account the effect which free convertibility at $35 might have on gold stocks.

It is idle to argue that the ratio between present gold stocks and total supply of currency is at least as high as it has been in the past during periods of free convertibility.

Historical Precedents

When the right to redeem greenbacks in gold was restored on the first of January 1879 it marked the end of postwar period totally different in character from the last 17 years.

In the post Civil War period the government balanced its budget and instituted a vigorous program of economy. Taxes were cut substantially. Between 1865 and 1879 the Federal debt on a per capita basis was reduced 44 percent.

The heads of central banks in other parts of the world did not indulge in silly dogma to the effect that government debt could be ignored "because we owe it to ourselves."

Finance ministers everywhere, but particularly in this country, were allergic to deficits. They did not take pride in their continued ability to live off the cuff. The financial conduct of governments, and again this applied particularly to the United States, did not serve notice on one and all that the currency would be worth less tomorrow than it was worth today.

Present Policy Inflationary

Yet this is precisely what the established fiscal policy of the American government is saying to the average owner of currency. During 17 of the last 19 years the budget has been in the red. Only last fall a member of the Board of Governors of the Federal Reserve System told a group of business men that their fears of growing government debt were unfounded since we "owed this debt to ourselves." Every citizen able to read knows that high level budgetary and monetary policy in Washington is directed by an echelon of technical advisors who believe in continuous inflation.

Under these conditions the right to convert paper dollars, whose value is

(*Continued on page* 30)

Face equipment gets complete overhaul in central shop

How An Efficient Maintenance Organization Functions

Close Cooperation Between Production and Maintenance Departments Develops High Operating Performance

By DAVID G. BUCHANAN

Maintenance Department
Rochester & Pittsburgh Coal Co.

GOOD maintenance, through a reduction in outages, means lower mining costs and maximum coal tonnage. No other single factor contributes more toward achieving good maintenance than a good maintenance organization. The Rochester & Pittsburgh Coal Co., Indiana, Pa., constantly striving for ways and means of reducing costs and increasing efficiency, has developed an efficient and effective maintenance organization for both underground and surface operations.

The company's operations consist of eleven deep mines and three strip mines, covering four counties in western Pennsylvania within a radius of 50 miles from the main headquarters office at Indiana, Pa., and one operation 135 miles south, in West Virginia. The average daily tonnage for all mines is approximately 25,000 tons of coal, not counting rejects. A total of eleven tipples, six cleaning plants, nine outside shops and six inside shops are operated at these properties. The underground equipment includes the major items of 12 continuous miners, 77 loaders, 206 cutting machines, 115 shuttle cars, 218 locomotives and approximately 4800 mine cars. A company owned power plant supplies electricity to all the Pennsylvania operations, with the exception of two mines where power is purchased; this means that the high tension transmission lines as well as low voltage distribution systems must be installed and maintained. All things considered, the maintenance department has a full sized job.

Cooperation Between Departments

To achieve the highest efficiency in a good maintenance organization, cooperation is of the utmost importance —from the general manager down through the chain of command to the men at the working faces. At Rochester & Pittsburgh the operating head of the company is the general manager—under him are the managers of maintenance and production on whom rests the joint responsibility for efficient and uninterrupted equipment performance which is so essential for low-cost tonnage.

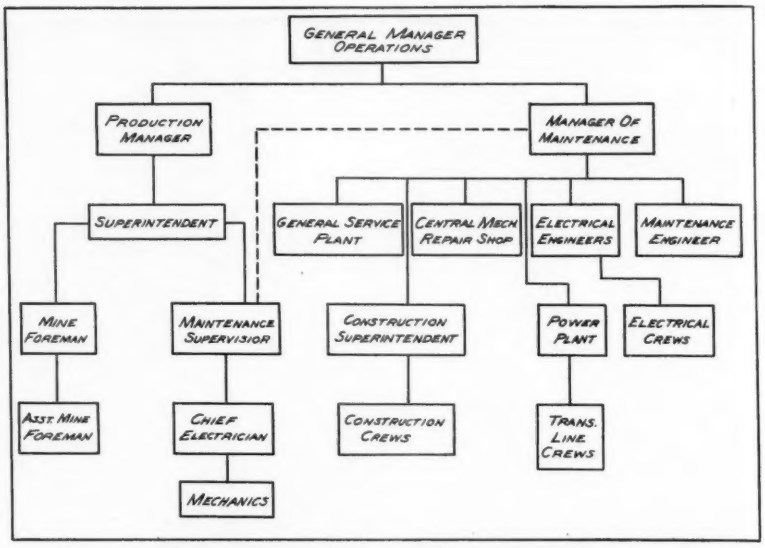
The production manager passes this responsibility directly on to the various mine superintendents and each superintendent in turn depends on his maintenance supervisors to keep the machines in good running order and on his mine foremen to see that these machines are operated to the best advantage. The manager of maintenance cooperates with the production department through his engineer who works directly with the maintenance supervisors at each mine. For the outside maintenance work there is the electrical department, construction department, general service plant and the central machine shop—each with its own superintendent or chief and each having its own spe-

cialized crews and equipment. This equipment may be mobile or stationary as will be described later.

As an illustration of how this organization works let us cite a specific example: The maintenance supervisor at a mine knows that a particular loading machine must come out of production and be sent to the central repair shop for complete overhauling or rebuilding. An inspection of the loader is made by the maintenance supervisor and engineer to determine the necessary parts to be ordered. The engineer then arranges for the ordering and shipment of these parts from the manufacturer, who, in turn, informs him that delivery will be in October. Arrangements are then made for the central shop superintendent to fit this into his schedule for complete rebuilding to start October 10. The maintenance engineer then gives this date to the supervisor who requests release of this machine from the mine superintendent for that date. If the release is approved it is then taken into the shop, on the scheduled date, for rebuilding.

If the superintendent does not agree or wants to keep the loader in production at that particular time, he makes his story known to the production manager, who notifies the manager of maintenance and they meet to determine whether this machine should continue in service. If an agreement is not reached, they refer the matter to the general manager of operations. Knowing the market conditions, he will determine whether it would be advantageous to tolerate poor and patch maintenance with lowered tonnage from this loader, now or to take the machine out of service for complete rebuilding with good production to come later. He may also authorize purchase of spare equipment, if necessary, to ensure proper maintenance and good production.

While the machine is in the central repair shop, a training program may be incorporated. When the maintenance supervisior feels that one or two of the mechanics who do the routine work on this loader at the mine and could profit by further mechanical training, they are sent to the shop to help tear down the loader and rebuild it. There the expert mechanics instruct them thoroughly in proper lubrication methods and good maintenance practices. In several instances, similar training of mechanics and maintenance men has been carried out when equipment was returned to the manufacturer for rebuilding.



Maintenance occupies key position in organization

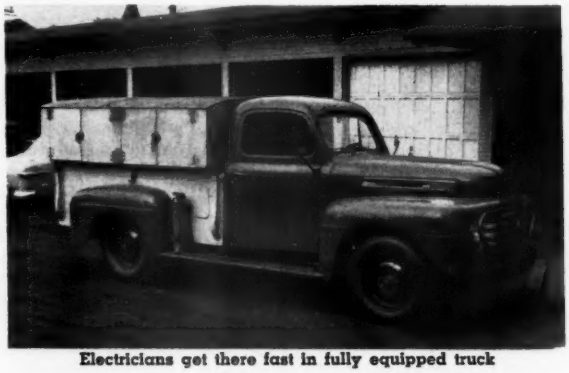
Surface Shops

Major electrical and mechanical rebuilding and repair jobs are handled in the central machine repair shop, under the direction of the manager of maintenance. The electrical department of the shop rewinds armatures, repairs both a-c and d-c motors and starters, overhauls control equipment and does other electrical work. The mechanical department does all classes of machine and mechanical work on all types of mining equipment including the complete rebuilding of locomotives, loaders, cutters, etc. Should the need arise, the shop crews are also available for field work when it is impractical or impossible to bring the equipment into the shop. A brass foundry for the casting of bushings, bearings, pump impellers, etc., is an important section of this central shop.

General repair work on the underground equipment is done at either the inside shops or the outside shops at each mine, depending on the extent of the repairs—the larger jobs being handled outside.

Another part of the maintenance department is the general service plant. Here timber for preservation treatment is stocked for drying and the creosoting is done at the company plant, treating approximately 1,500,000 board feet of timber per year. A repair shop is operated here for wrecked or damaged mine cars. This shop rebuilds approximately 500 cars a year, besides manufacturing certain mine car parts it also does general steel fabrication and has a bit sharpening setup which handles approximately 16,500 machine bits in a five-day week. A motor pool, consisting of both large and small trucks as well as passenger cars for company personnel use is located here. Trucking

Construction crew is prepared and on the spot when needed



Electricians get there fast in fully equipped truck

operations for hauling supplies to the mines and the transfer of equipment between mines is a function of the general service plant.

Mobile Repair Shops

General outside maintenance and construction is efficiently carried out with trucks fully equipped to handle most any type of work, day or night, emergency or general maintenance. The trucks operate from the general service plant and are equipped according to the type of work each crew performs.

The electrical crews have four trucks; two panel body and two covered pickup trucks. They carry all types of testing meters, hoisting and rigging equipment, and a complete welding outfit. In the event of an emergency electrical failure at a mine, substation or cleaning plant that cannot be handled by mine personnel, these trucks are ready to move any time day or night without any delay for assembling supplies, tools or equipment.

The construction crews have two trucks completely equipped for every type of mechanical, erection or construction work, including a winch and pole derrick arrangement for line construction. These trucks too are kept ready for any day or night emergency.

The plumbing crew has its special truck with all necessry tools including a power driven pipe threader. Some companies may question the necessity of an expenditure for a power driven pipe threader, but with the present wage rates, and where a considerable amount of pipe threading is done, this threader will pay for itself in a very short time by reducing labor costs. For example, it takes two men approximately three hours to cut a thread on 3 in. conduit with hand dies; with a power driven threader, two men can set up the equipment and do the job in about thirty minutes. From this it can be readily seen that an appreciable saving in manhours would be made over a period of time.

The carpenters crew has a fully equipped truck, enabling it to perform efficient and thorough work wherever called. The power and transmission line crews also have one large fully equipped truck and one pickup truck for general utility use in the construction and maintenance of transmission lines. In addition two other trucks are equipped with complete welding equipment for use by these crews.

Other portable equipment for use by the maintenance crews includes pipe dies and a hydraulic pipe bender; a Pumpcrete machine for speedy concrete placement; and a truck mounted crane, that can be used for either shovel or crane work.

The theory for maintaining these trucks and auxiliary equipment is that considerable time is saved in getting the men and material to the job with a minimum of delay. Since the company's operations are spread over a wide territory it is necessary to have flexible and complete facilities available that can handle more than one emergency or routine job at one time. We have found that the savings in time, for getting supplies and materials together and transporting them to the job location, offsets the expenditure for this equipment. It is highly efficient and mobile and has proven most satisfactory in every type of work encountered.

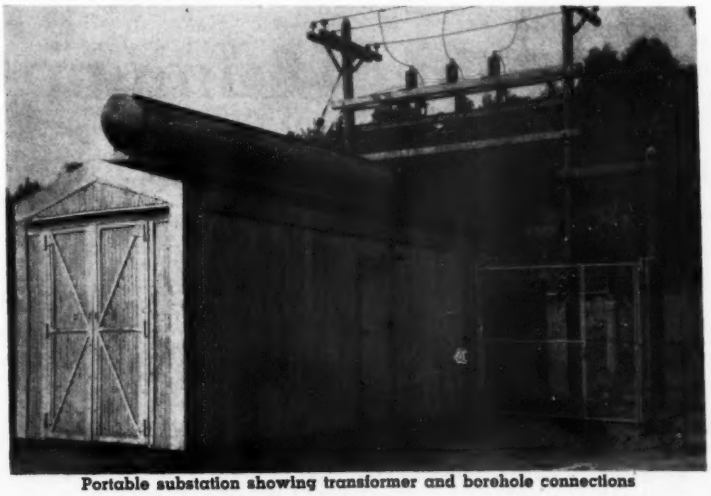
In the event of a breakdown at the mines, the tipples, cleaning plants, transmission lines, substations, fans, haulage hoists, etc., the mine management contacts the maintenance department to secure the necessary assistance of the maintenance engineers, or travelling crews, depending on the nature of the breakdown. These crews, with headquarters at the general service plant, keep in constant touch with the plant office so they can be located with a minimum of delay in the event of any emergency.

To demonstrate how this system works let us take a specific example and assume that one of the cleaning plants develops electrical trouble of an undetermined nature causing part or all of the plant to cease operation. Immediately the superintendent contacts the electrical engineer in the maintenance department, who is in charge of the travelling electrical crews, or in his absence, the chief clerk, and informs him of the trouble. The foreman of the appropriate crew is at once located, told the nature of the emergency and arrangements are made to move his crew to the job location as soon as possible. If the first crew is already on some important work, another crew is sent out.

This system is also applicable to the crews handling other types of work and has proven to be an important and efficient part of our maintenance organization. It has resulted in considerable savings to the company, as outages due to breakdowns and emergencies are minimized, time is saved in getting the men, material and equipment to the job and tonnage loss through cleaning plant and tipple outages is kept to a minimum. This has become possible through a flexible and efficient maintenance organization.

A Portable Substation

All phases of power come under the jurisdiction of the maintenance department. This includes the operation of the company power plant and also the erection and maintenance of high tension lines, the substations and low voltage distribution systems underground. With mine mechanization steadily increasing, headings advancing faster and further, the problem of getting adequate power to the face, at a minimum cost, is becoming more and more complicated.



Portable substation showing transformer and borehole connections

To help simplify this problem the maintenance department designed and built a portable surface substation which can be moved from one location to another as power requirements change from time to time. These portable stations are approximately 22 ft long, 10 ft wide and 12 ft high, over-all, built with H. H. Robertson protected metal of sandwich construction to provide insulation. They are equipped with either 500-v, 500-kw rotary converters or mercury arc rectifiers. The transformer or transformers are located outside the building. Switching is done on the low side of the transformer, which are protected with high voltage fuse cutouts. Low voltage is taken underground through a borehole.

(*Continued on page* 105)

Through this mill passes uranium ore from the mines on its way toward atomic power

Processing Uranium Ores

Hydrometallurgical Methods Used to Treat Domestic Materials

By F. W. McQUISTON, JR.

Metallurgical Adviser
Raw Materials Operations
U. S. Atomic Energy Commission

A NEW industry was started when uranium milling made its introduction into the mining field in 1942. At that time, tailing piles accumulated from milling vanadium ores in Colorado were leached for the recovery of uranium. Since then uranium production has steadily gained momentum and this new industry is destined to play an important role in the field of mining and milling.

There are now six uranium mills operating in the United States at Rifle, Uravan, Naturita and Durango, Colo., and Monticello and Hite, Utah. One other mill is under construction and two more proposed for the near future. Canadian and foreign milling operations add to this number. The largest milling operations on which information is available are those at the Shinkolowbe mine, Belgian Congo; Eldorado mine, Great Bear Lake, Canada; and on the Colorado Plateau in Colorado and Utah. Other potentially large uranium producing districts exist in South Africa, Canada and the United States.

It is definitely indicated that in the near future several million tons per year of low-grade materials will be milled for the recovery of uranium, or processed for by-product uranium production. When these plants are in operation the uranium industry will assume an important status among other prominent nonferrous metal enterprises.

The large annual tonnages scheduled to be processed place great importance on research, process development, flow sheet layout, and plant design. The AEC Raw Materials Operations office has met this problem by carrying on an extensive research-process development program for the recovery of uranium from many types of uranium bearing materials and ores found throughout the world.

Uranium is widely distributed in the rocks of the earth's crust. It is more plentiful than gold and silver, and almost as plentiful as lead and zinc but, unfortunately, it occurs sparingly as highgrade ore deposits. Of the great variety of uranium occurrences pitchblende ores have been by far the most productive. Uraninite, another primary mineral, has considerable economic importance. Secondary minerals, such as torbernite, autunite and carnotite have also contributed to production.

The great gold deposits of the Witwatersrand, South Africa, the oil shales of Sweden, and the marine phosphate deposits in the United States offer potential by-product uranium production.

In the United States the carnotite and roscoelite-type uranium-vanadium ores of the Colorado Plateau have to date contributed all of the domestic uranium production. These low grade secondary ores are distributed over an area of more than 30,000 sq miles and constitute the largest, readily available source of uranium in the United States.

The Colorado Plateau is reaching a high level of activity and is assuming a prominent place in world uranium production. It is interesting to note that this district is in its third era of world prominence in ore processing. During the period from 1900 to 1924 the carnotite ores were mined primarily for radium. In fact, from 1916 to 1923 production of radium from carnotites gave the United States the world's lead in radium output. Ore production from 1924 to 1940 was principally for vanadium. In 1941 the United States became the world's leading producer of vanadium, a position that it still holds. Uranium

production from this field is now an important contribution to the military strength of the United States.

Applicable Techniques

The primary uranium minerals, pitchblende and uraninite, generally are amenable to concentration by gravity methods. Hand sorting, mechanical picking with a Geiger counter, jigging, tabling or spirals are methods of concentration that have been applied to the better grade pitchblende ores. Concentration by these methods may be generally compared with the gravity recovery of galena. Gravity concentration is not being used on lowgrade primary ores or on secondary ores. In the lowgrade primary ores, the uranium minerals are usually too finely disseminated to be liberated except by extremely fine grinding. The secondary minerals, autunite, torbernite and carnotite are soft minerals with low specific gravity and for this reason are not amenable to gravity concentration. Dry mechanical scrubbing followed by air classification does appear to offer some possibilities for concentration of certain types of secondary ores.

Uranium does not occur as a sulphide and, therefore, cannot be recovered by sulphide flotation practice. However, sulphide flotation is employed to float other sulphide minerals away from the uranium, thereby effecting some concentration of uranium in the flotation tailings. Nonmetallic flotation methods have been studied in the laboratory for the recovery of uranium and may possibly have application to some types of ores. Nonmetallic flotation will have limited application because the uranium minerals in lowgrade ores generally occur as micronsized particles disseminated throughout the entire material, which results in non-selective concentration and low recoveries. Complete liberation is not possible even with extremely fine grinding.

Leaching Proves Most Effective

Hydrometallurgical methods offer the most effective treatment for the recovery of uranium from its ores and from other uranium bearing materials. It may, therefore, be concluded that uranium bearing ores, and materials, are more amenable to treatment by extractive metallurgical methods than by mineral dressing methods.

Most uranium minerals are readily dissolved by acids and some of the secondary minerals are also dissolved by alkali carbonates. Uranium is, therefore, recoverable by a process using a solvent or lixiviant and the removal of the resultant solution from the undissolved portion of the ore. This led to the development of a leaching process which would utilize available and lowcost chemicals. The most common leaching agents now used are sulphuric acid, hydrochloric acid and soda ash. The choice between these chemicals for a leaching agent is dependent upon the type and character of material to be treated because the leaching behavior of individual uranium minerals is somewhat different.

The process of using dilute sulphuric acid and ferric sulphate for leaching copper is applicable to leaching primary uranium minerals. For leaching torbernite ores strong, hot, sulphuric acid solutions are required. Autunite is readily soluble in dilute sulphuric acid and, to some extent, in hot soda ash solutions. Carnotite is quite soluble in dilute acids or in hot soda ash solutions.

From the above data it becomes apparent that processing uranium ores is quite similar to the hydometallurgical methods used in the leaching of copper, gold and silver. The flow sheets for the recovery of uranium are almost identical to those used in the cyanidation of gold and silver ores. Crushing, grinding and classification follow standard milling practice. Three types of leaching flow schemes are generally used. Where fine grinding is not an important factor, leaching is accomplished in vats by upward or downward percolation of the solutions; where fine grinding is employed the typical flow sheet uses either the standard continuous counter-current decantation method, the filtration system, or possibly a combination of both. The equipment used in all uranium mills from the ore bins to the tailing race is standard type equipment. If acid is used as a lixiviant the equipment only requires acid proofing to adapt it to uranium leaching.

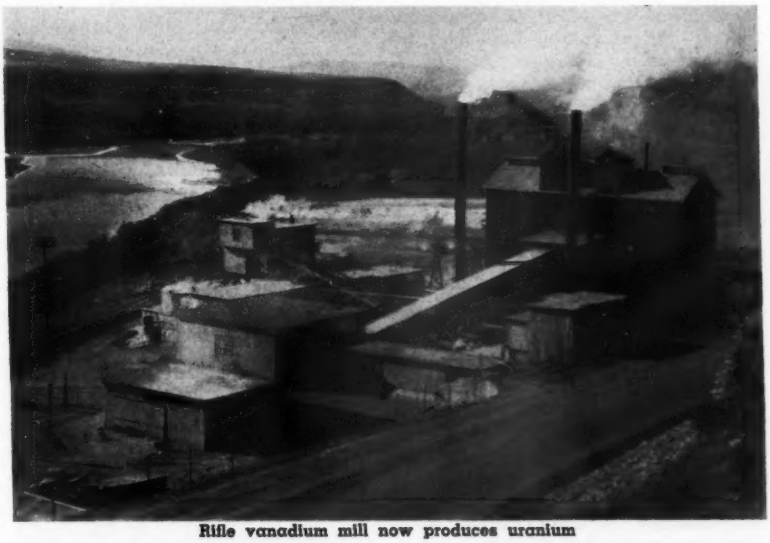
Processing Domestic Ores

Uranium milling in the United States is, at present, entirely confined to processing carnotite-roscoelite ores produced on the Colorado Plateau. Roasting prior to leaching is used on the Plateau for the recovery of vanadium. Colorado Plateau ore roasting flow sheets follow the same pattern of many cyanide plants which roast refractory arsenical and telluride ores prior to cyanidation.

Two different processes are used today on the Plateau for uranium-vanadium recovery. One process involves leaching with cold hyrochloric acid solutions and the other is leaching with hot soda ash solutions. The choice between these processes depends upon the character of the ore to be treated.

"The acid process" is currently being used in two Colorado mills. This process consists in general of dry crushing the ore to minus 14 mesh, mixing with 6-10 percent sodium chloride and roasting in multiple hearth furnaces. Calcines from the roaster are first leached in place by percolation with water which extracts 70-75 percent of the vanadium as water soluble sodium vanadate. The water leached tailings are releached by percolation with dilute hydrochloric acid solution which has been obtained by scrubbing out the hydrochloric acid produced in salt roasting. Acid leaching dissolves about 90 percent of the uranium and approximately 15 percent additional vanadium. The vanadium content in the water leached solution is precipitated as "red cake." The uranium precipitate obtained from the pregnant acid leach liquor is subsequently twice dissolved and precipitated to obtain the final uranium product.

Temperature is perhaps the most



Rifle vanadium mill now produces uranium

single important factor in the salt roasting operation. A temperature of 850 C is about optimum from the standpoint of both uranium and vanadium recovery. Water scrubbing of the roaster gases provides a cheap and convenient source of acid leach solution.

"The acid process" is efficient for the recovery of both uranium and vanadium. The major limitations of the process are imposed by the lime content of the feed material. For the most satisfactory operation of this process the lime content of the head ore must be restricted to less than 2.5 percent. A higher content affects the production of hydrochloric acid during roasting and the consumption of hydrochloric acid during leaching. In leaching ores containing one to two percent lime the hydrochloric acid recovered from the roaster gases is approximately sufficient to furnish acid required in the leaching of the calcine. For ores with a higher lime content some sulphuric acid must be used to fortify the hydrochloric acid solutions. Under optimum conditions 50 lbs of hydrochloric acid per ton of ore roasted can be obtained. An increase of one percent lime tends to decrease the hydrochloric acid product by 10 lb per ton of ore. With ores containing a lime content greater than five percent almost no water soluble vanadium is formed by the roast, which is unfavorable to the precipitation cycle.

"The carbonate process" is being used in three mills on the Plateau. At the Monticello AEC mill, roasting is economically feasible only for ores containing over one percent vanadium; otherwise the raw ore is leached directly with hot sodium carbonate solutions. The carbonate leach flow sheet, in general, is identical to the acid flow sheet. The ores are reduced dry to minus 10 mesh and roasted with 6-10 percent salt. The hot calcines are quenched in soda ash and then agitated if fine grinding is used. If the calcines are not reground they are leached in place by percolation. Leaching with soda ash extracts 85-90 percent of uranium and vanadium. The recovery of uranium and vanadium from the pregnant leached liquors is affected by pH control with the addition of sulphuric acid. Through pH adjustment by regulated additions of sulphuric acid virtually all of the uranium is precipitated as "yellow cake," an artificial carnotite. After precipitation of the uranium further additions of sulphuric acid precipitate vanadium as "red cake."

The "carbonate process" requires more careful plant control than the "acid process." In general the finer the particle sizes in the roaster feed the higher the uranium extraction from the calcine. However, dust losses are an important economic factor and thereby control the size of the roaster feed. Temperature control is another important factor for both uranium and vanadium recovery. Rapid quenching of the calcine is essential to good metallurgical recovery. Leaching solutions must be kept as close to the boiling point as practicable. A large volume of leaching solution or a high strength solution up to ten percent sodium carbonate definitely aids extraction; however, since excess carbonate must be neutralized for precipitation chemical costs are factors of importance.

The "carbonate process" has several advantages. One, precipitation is simple and reasonably economical and, two, cost of the process is not materially changed when processing ores which contain lime. Uranium recoveries by acid leach are better, perhaps, than those from the carbonate leach. The cost of acid leaching will vary considerably according to the lime content of the ore. The cost of acid leaching for low lime ores is very reasonable. The main difficulty with the "acid process" lies in the recovery of uranium from highly contaminated acid leach liquors. Uranium is separated from the leached liquors by a complicated process in which the solution is taken past neutral several times by alternate additions of acids and bases. As a consequence, the costs for labor and reagents are high.

Research for Improved Methods

The Atomic Energy Commission has been pursuing a definite course of research and process development on many types of domestic and foreign uranium ores and uranium-bearing materials. Even though mineral dressing methods of concentration are not generally applicable to many uranium ores, the ores do respond to chemical leaching. It is the goal of Raw Materials Operations to develop a method of hydrometallurgical processing which is as amenable to uranium ores as cyanide leaching and zinc precipitation are to gold ores.

The Commission is currently sponsoring work on uranium raw materials at the Dow Chemical Co., Oak Ridge National Laboratory, Massachusetts Institute of Technology, and the U. S. Bureau of Mines, Salt Lake City Station. For security reasons much of this work is classified; however, the results of the work are readily available to cleared personnel in industry to aid them in solving their metallurgical problems. These laboratories are at the service of the mining industry to assist in uranium ore testing and flow sheet layout.

Future of Gold

(*Continued from page* 24)

continuously evaporating, into real gold, the best known hedge against inflation, at $35 an ounce, would invite a stampede for conversion. The Treasury would find itself in the position of a trader who was offering $70 for $35. It is not necessary to have a Ph.D. in economics to forecast the result. Fort Knox would lose all its gold over night. It is for these reasons that the demand for convertibility at the present arbitrary, fixed price of $35 is unrealistic.

Nevertheless the right of conversion should be restored at the earliest possible opportunity. The American dollar should not continue to be a football kicked back and forth by the ivory tower specialists of the Treasury and the Keynesian pundits of the Federal Reserve Board.

This is an area in which the right of decision, and the power that goes with it, should be restored to the American public from whom it was furtively filched in 1933. The fighting in Korea must not be permitted to serve as a pretext for the perpetuation of bureaucratic authority to control the American dollar. It must not be the occasion which the self styled "competent and responsible men" of the Federal Reserve may seize to freeze forever their usurped authority to manage our money.

Free Gold and the Dollar

Let the dollar and gold find their own levels in a free open market during a limited period of probation. Let the level so determined be the new parity between gold and money.

With this tested parity the American holder of currency may again enjoy the right of conversion. Our government may then know that as long as its fiscal conduct commends itself to the people of this country there will be no run on our gold stocks.

The United Nations profess to be fighting for freedom and justice in Korea. There is no doubt that every patriotic American deeply believes this to be so. He is willing to reach into his pocket for added taxes to promote this purpose. He is willing to shed his blood if necessary to serve this cause. Beware, lest preoccupation with the foe on the other side of the world, protect unscrupulous thieves of power at home.

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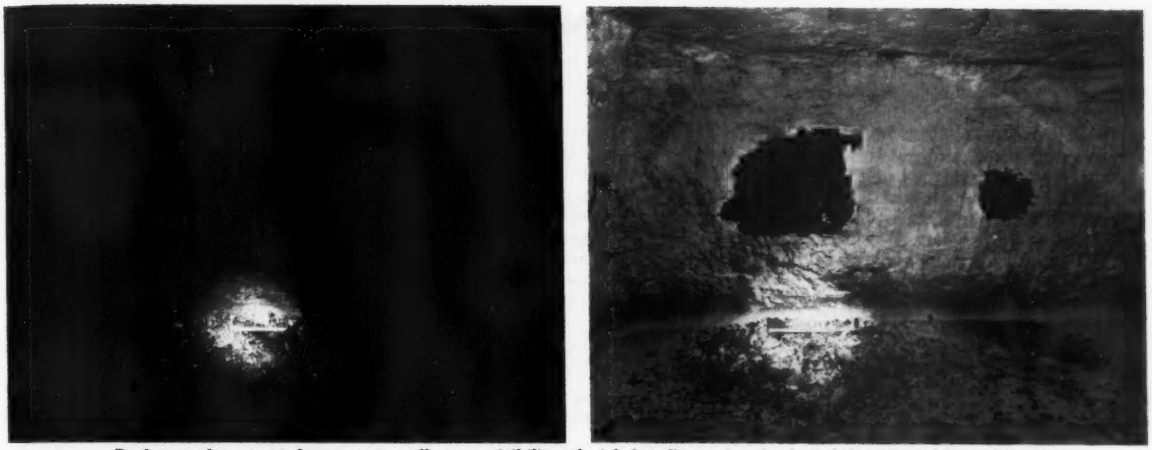

Background contrast demonstrates effect on visibility of pick handle against fresh and dusted coal face although illumination is equal

Illumination for Efficiency

Improved Visibility Underground—Goal of Mine Lighting Clinic

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ILLUMINATING engineering is a comparatively new branch of technology as the intensive research which has developed modern lighting did not get started until about 30 years ago. The results have been far reaching. As research progressed we, as a country, have become light conscious and revolutionary improvements made in the illumination of homes, offices, schools and factories have contributed in large measure towards present high standards of comfort, health and working efficiency.

Industry has profited greatly by the application of knowledge learned in the laboratories and to a great degree has been able to bring daylight indoors. But to many it has seemed that mining—which admittedly has a great need for illumination—has not profited at all. This belief, however, is not quite correct as witness the advance made from the miner's oil lamp of the early 1900s to the present day electric cap lamps. The improved cap lights have been for the benefit of the individual but mining is rapidly changing from individual to group working, so a new underground lighting technique must be developed.

Illumination is a new field for most mining men so it is fortunate that considerable knowledge on the subject is already available. This was clearly brought out in a Mine Lighting Clinic held recently at General Electric Lighting Institute, Nela Park, Cleveland. The meeting, sponsored by National Coal Association, was attended by a group of about 30 representatives of coal companies, manufacturers, state and Federal agencies. The program was arranged by G. F. Prideaux, illuminating engineer of General Electric, who heads the special lamp section of the engineering division and has been conducting underground tests to determine factors that affect underground illumination. The talks given at the clinic by Mr. Prideaux and several engineers of his staff, illustrated by actual demonstrations, were extremely valuable in bringing out basic problems of mine lighting. M. H. Forester, Pittsburgh Consolidation Coal Co., discussed the need for improved visibility and E. J. Gleim, U. S. Bureau of Mines, outlined the safety features involved. The main points are set forth in the following brief digest of their talks.

Large equipment requires maximum visibility to realize maximum efficiency

TECHNOLOGY OF ILLUMINATION

By G. F. PRIDEAUX

WHEN we see an object or a scene four factors affect visibility: (a) size, (b) color contrast, (c) brightness, and (d) time. We are not concerned with the first and last items in this list because underground objects are large enough and move slowly enough to be well within the visual range. Our interest is with brightness and contrast. It will be through understanding and applying knowledge derived from this interest that underground visibility will be improved. Contrast needs little explanation, as we are all familiar with the use of protective coloring and camouflage for concealment. Unintentionally, camouflage is practiced to a high degree in coal mining—coal lumps on the floor, coal dust on machines and equipment all blend into the solid black background of the faces and ribs and thus tend to become invisible. Obviously to eliminate this the first step should be to produce as much contrast as possible. Light colors for machines and equipment, retrodirective buttons, signs and paint, rock dusting the ribs and roof, and white brattice cloth are all means toward this end. Their most effective use should be determined. The difficulties resulting from coal dust in the air and from water sprays that settle on machines are certainly not insurmountable even though they may necessitate a certain amount of "maintenance" in the form of washing, cleaning and even frequent repainting. The effort is well worth it, although as shown in Table I by the effect of contrast on required illumination to maintain a visibility level of five on a relatively large object.

Table I—Relationship between contrast and illumination

Percent contrast	Brightness of Object in Footlamberts
95	1.6
90	1.8
80	2.1
70	2.5
60	3.0
50	3.7
40	4.8
30	6.5
20	9.6
15	14.0
10	24.0
5	75.0

The factor of brightness is the most important item in illumination and one which is the least understood. To give a nontechnical definition, the brightness of an object is the amount of light reflected by it rather than the amount falling on it. It is measured in footlamberts. In practice we find that this factor is one over which most control can be exercised. In general, to provide better visibility the brightness of an object is increased by putting more light on it. The visibility level does not increase in direct proportion to the illumination. The relation is logarithmic. To increase the visibility of an object by even a small amount requires a large increase in the illumination, other things remaining equal. The chart gives the relationship between visibility-levels and foot candles of light; this shows that to raise the visibility-level of an object from two to five requires an increase in the relative illumination from about 150 to nearly 2000 foot candles. To paraphrase a time worn saying regarding heat and humidity *it isn't the light, it's the visibility* that counts.

Group working necessitates new underground lighting techniques

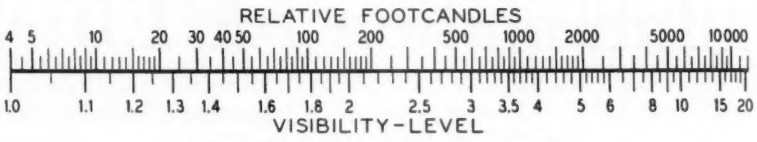


Chart showing visibility level vs illumination

For a clear understanding of the terms used in the tables and accounts of the underground tests, the following are offered:

(1) A *Candlepower* is the luminous intensity of the flame of an ordinary vertical candle about one inch in diameter.

(2) The *foot candle* is the measure of the illumination on a surface. At a distance of one foot from a light source of one candle power, the level of illumination of the surface is one foot candle.

(3) The *footlambert* is the measurement of brightness; if the diffuse reflection-factor of a surface were 100 percent each foot candle would produce a brightness of one footlambert. (Reflection factors for various surfaces and colors have been determined and tabulated.)

(4) A *Visibility-Level* of one would be exemplified by a printed page of the *Reader's Digest* under an illumination equivalent to the light from two full moons. In general, a visibility level of five is considered satisfactory for industry.

Several mines were visited to obtain actual visibility data. Readings were taken with visibility meters and with brightness meters. Brightness readings were taken on white test cards to determine footcandles. The readings were made as unobstrusively as possible so as to get them under normal working conditions. The results can be summarized as follows:

Test A—Visual Task—directing mechanical loader into coal

Light source—1 cap lamp plus 2 headlamps on loader

Visibility before starting 1.8

From headframe to shaft bottom, better visibility pays dividends

Visibility after starting 1.2 (due to dust)
Brightness of coal 0.03 ft-L
Brightness of loading head .035 ft-L
Footcandles 3.1
Contrast 15 percent

Contrast was only 15 percent, hence visibility was only 1.2. To reach visibility of 5 would require a 110 times increase in illumination.

Test B—Visual Task—Drilling blasthole at face

Light source—1 cap lamp
Visibility: White chalk mark—on face—2.1
On drill at face 1.52
Brightness of drill 0.077
Brightness of coal 0.032
Footcandles on task 3.2
Contrast 64 percent

To raise visibility to 5 would require an increase of 40 times in illumination. Higher visibility on chalk mark due to greater contrast.

Test C—Visual Task—Directing cutting machine at face.

Light source: 1 cap lamp
Visibility 1.48
Brightness of cutter bar 0.025 ft-L
Brightness of coal 0.020 ft-L
Contrast 20 percent
Footcandles on task 1

To raise visibility to 5 would entail an increase of 35 times in the illumination.

BETTER ILLUMINATION NEEDED

By M. H. FORESTER

MINING as a whole and the coal industry in particular has at the moment no opinion one way or the other on the subject of mine illumination,—it simply has not been given much thought. Miners have through generations become accustomed to working in semi-darkness. The lack of illumination has been accepted as a characteristic of the industry. Even though there has been no general demand for better lighting from the industry at large, the urge to do something about it has occasionally inspired individuals. A limited number of test installations were tried—but without much success as far as face illumination is concerned.

Coal mining rightfully considers itself a progressive industry. If it is to maintain this claim it can ill afford to remain indifferent to the benefits of better illumination. Other industries have made great strides in setting new standards and improving plant visibility. The work done in many of these industries differs but little from the work of the miner underground. The claims made by these industries of a definite lowering of accident rates, coupled with increased efficiency and productivity are supported by facts. It stands to reason that mines should be able to benefit similarly.

Continuous mining in its ultimate application means a radical departure from the cycle type of operation to which mining men have long been accustomed. Production will be derived at a high rate in tons per hour, from a limited number of working places concentrated in a relatively small area. There will be fewer machines and fewer men; but they will be operating in close proximity to one another and at a relatively high rate of speed, with maximum continuity throughout the working period. Extraction will be continuous, instead of intermittent,—transportation *must* be continuous, and roof control as much so as physical conditions will permit.

With from three to six men and probably three pieces of machinery working and moving around in a small area, it doesn't require much imagination to realize the urgent need for adequate illumination and visibility. This same concentration, which focuses attention on face lighting, simplifies the problem in some respects while complicating it in other directions. The electric power supply can now more readily be independent of the main power circuit—allowing it to remain operative during interruptions of the latter. Low voltage circuits can be more readily made available. The rapid advance of the face requires almost continuous extension. Lamps and fixtures must be made of rugged, shatter-proof materials, must be readily movable, and must comply with the standards of the U. S. Bureau of Mines for gaseous mines. The matter of attachment to roof or rib is complicated by lack of space. Glare must be controlled.

Before the idea of face illumination can be sold to the coal industry it will be necessary for research and engineering to develop the proper equipment for underground use. Mining men still associate face lighting with flood lighting, and the average mine worker associates this with "glare" and "blinding," to which he rightfully objects. Experiment and testing under the variable conditions prevailing in the different mining districts goes hand in hand with development. Considering the intimate knowledge of mining conditions; of legal and safety requirements and of the technical, practical and human phases of the industry, it should not be too difficult to set up a program, which would not only determine the standards of lighting or illumination desirable for underground operations, but also how it might be accomplished.

One more consideration, which should not be overlooked, is the psychological effect of better illumination on the public, which not only passes judgment on our industrial health, but

Better lighting leads to better safety

provides us with future mine employes. Much has already been done to make surface plants more attractive to the eye. The same must be done for the plant underground, if young men of the greater skill required for future mining are to find work underground attractive. Good illumination is an important phase of any plan of modernization. Face lighting of the right type will pay its way by an improved safety factor and greater all around efficiency in mine operation.

Good illumination means more tons hauled

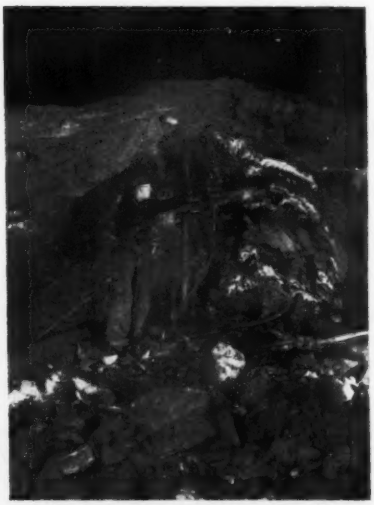
SAFETY AND MINE LIGHTING

By E. J. GLEIM

TO obtain Bureau of Mines approval, an electric cap lamp must meet several safety requirements, the most important of which is that an explosive methane-air mixture must not be ignited if the lamp bulb breaks. The reliability of a cap lamp with respect to this requirement is determined by actual test in the Bureau's laboratory.

The method of preventing gas ignition by exposed filaments is not as reliable for the larger lamps used in machine and locomotive headlights as for cap lamps; therefore the Bureau requires that headlights on permissible machines be of explosion-proof design and well-protected mechanically. This means a construction capable of withstanding internal explosions of methane-air mixtures without damage to the enclosure and without discharge of flame from any joint or cable entrance. The lens must be at least one-half inch thick. The wiring to headlights must be protected both electrically and mechanically. Unfortunately, on many machines, especially loaders and cutters, the headlight position that would be best suited for proper direction and focusing is more than likely one where the headlight would be seriously exposed to damage during normal maneuvering of the machine. Even in less-exposed positions the Bureau has requested that special guards be provided to protect against damage from rapidly moving coal.

State and Federal codes in general have prohibited installation of fixed lights at the face in coal mines. Such lights and the circuits or cables serving them are exposed to damage from blasting operations or from moving equipment.



In the stope—to see is to be safe

Although fixed lighting is permitted in areas on intake air away from the face and does not present the same problems as at the face, nevertheless it is somewhat inadequate and not entirely free of hazards. Lighting circuits connected to d-c trolley systems are subject to the same conditions of low or fluctuating voltage as headlights of d-c machines at the face.

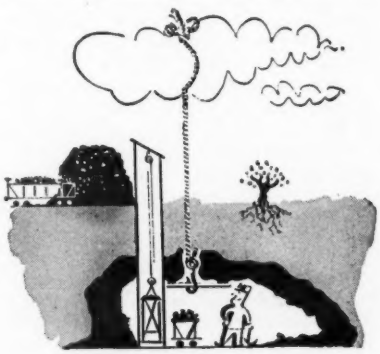
Fixed lights connected to a-c circuits offer certain advantages and safety features not obtainable when connected with a trolley circuit. It should be possible to supply energy from a-c circuits at a voltage more nearly constant than is usually possible with d-c circuits and so avoid the dim or fluctuating lights that often can be seen along trolley haulageways. A lighting circuit independent of the power circuit that feeds the underground machines and locomotives would provide greater safety through uninterrupted light during periods of power failure.

Although it is safe to assume that considerable improvement in underground lighting can be gained by employing better-designed and more efficient headlights, lighting fixtures, and portable lamps, the greatest obstacle to the achievement of adequate lighting appears to lie in the fact that approximately 95 percent of the light striking an untreated coal face is absorbed there. With locomotives operating at higher speeds, a motorman must be able to distinguish objects and determine conditions at greater distances than before. Likewise, the operator of the new types of machines at the face must be able to distinguish cutter heads, loading booms, timbers, and other objects at greater distances than before. This ability is enhanced by providing contrast. Painting machines with light colors is one method of obtaining this contrast.

However, it is obvious that if more of the already available light could be reflected instead of absorbed, visibility could be greatly improved. The application of rock dust as a means of preventing coal dust explosions appears to offer the most logical method of reducing the amount of absorbed light. Up to the present, it has been difficult to keep the face regions rock-dusted as rapidly as advances are made and ways of accomplishing this seem to warrant careful study.

Light on the job keeps fingers on the hands

Undoubtedly much more can be done to provide better visibility underground. It is doubtful, however, whether fixed lighting or machine headlights will ever entirely supplant the miner's electric cap lamp. In many areas underground it would not be safe or economical to install lighting circuits. Inspection and other duties in these areas will require that men have suitable portable lamps to enable them to perform those duties properly.



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- **This picture really brings out the sturdy construction and massiveness of the Jeffrey 70-UR Universal Coal Cutter. It is shown making a shearing cut in the mine. Full hydraulic controls provide ease of operation for all adjustments and feeds. Tramming and cable reel operation are also hydraulic.**

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J. Howard Morgan, secretary-treasurer of the Cedar Heights Coal Company, Oak Hill, Ohio, makes that statement about the new International TD-24 working on the company's stripping operations. "We are completely sold on International equipment," says Mr. Morgan. "We use four units in our operation here and they can't be beat. In six months use we have had no repairs except one minor item. This TD-24 looks like it will duplicate the endurance of our International TD-18 which operated two years before the engine was touched."

This is a statement by one more highly satisfied TD-24 owner. Never before has a tractor been so perfectly adapted to strip mining operations. The broad range of speeds, eight forward and eight reverse, on-the-go shifting with synchromesh transmission and the separate forward-reverse shifting lever combine to make the TD-24 the ideal tractor for strip mining. When you add the unequalled ease of control provided by "Planet Power" drive you'll find the TD-24 a matchless crawler when there's dirt to be moved.

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Trackless Mechanized Mining In the Lead Belt

Conclusion of Report on Successful Operation of Tread and Tire-mounted Equipment in Open Stopes

By R. T. MURRILL and PETER B. NALLE

General Mine Superintendent and Mine Engineer, Respectively, St. Joseph Lead Co.

MINE No. 20 is an all trackless operation and uses one Joy loader and one St. Joe shovel in conjunction with two Joy shuttle cars. The shuttle car operation is similar to those described except that the car discharges its load directly into a small skip pocket at the shaft. For its long hauls two trolley poles are used, one for the ground and one for the hot wire, in conjunction with standard 4/0 trolley wire on hangers. For the short hauls and travel in the headings the reel on the car is used. The shift from reel to trolley is made by unplugging the Miller plug at the end of the reel cable and putting up the poles. The haulage grades are kept to 2-3 percent against the load on long runs, but short runs have been made up to 6 percent. The average length of haul has been about 500 ft and the maximum haul was 1000 ft.

In order to move the loaders for the long distances, a rubber-tired, two-wheel trailer takes the place of the shovel truck normally used on mine track. This trailer is pulled by the shuttle car and its use saves the travel mechanism on the equipment and shortens the moving time.

At this installation the tonnage hauled from 1947 to date is 311,610 tons. The mine manages its own minor maintenance problems, and is 28 miles from the main source of supplies and the shops.

The Doe Run Mine is another all trackless operation. It, too, is an outlying mine and 12 miles from the main shops and source of supplies. At this mine one Joy loader and one shuttle car are used. For its long hauls a double trolley wire and harp are used with a single trolley pole. The round trip for the shuttle car on the 1900-ft haul is about 15-20 minutes depending on the loading conditions. This mine has produced 217,169 tons of ore from 1948 to date with its trackless equipment. Its average length of haul has been 600 ft with a maximum haul of 1900 ft.

Another mine is now in process of

being equipped for all trackless operation. Desloge Mine No. 7 is an old mine that has been out of operation for 2½ years. A new level about 100 ft above the old working level is being developed to mine newly outlined zinc ore bodies. The haulage will be trackless and haulage equipment will discharge into ore pockets at No. 7 shaft.

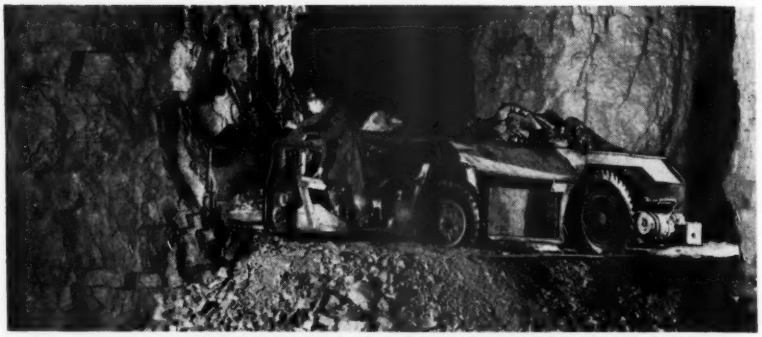
In order to minimize grades, dump points to the ore pocket have been established at three different elevations. The average length of haul during the first year of operation will be about 700 ft with some of the hauls running up to 1800 ft. The new haulage routes are in places going through the upper openings of the old mines. A large proportion of the development rock from the drifts now being driven is used for fill to make roadways across old stopes. At two places a total of about 500 ft of 20 ft high fill is required. In making this fill, it is found that the shuttle car could be used to pack the rock for the roadway. Fill made by a scraper or by shooting down back is not compacted well enough on top to support the weight of the shuttle car. Current practice is to lay boards on the last 15 ft of fill to help hold the car up as it dumps. As the fill builds up the car is used to push the rock over the edge, maintaining a uniform grade. The boards are picked up and advanced as the fill advances.

Main haulage roads are being laid out from level to plus or minus 2 percent from level. Roads near the working headings will assume grades that follow the ore. During the second year of operation of this mine the hauls will be largely on distances up to 2500 ft. This will provide the first trackless experience on the longer distances and should give interesting data for future operations on long hauls.

This mine is being equipped to handle 2000 tons of ore per day. All development work is being done with Joy loaders and shuttle cars, aided by dragline equipment. This project demonstrates our faith in the future of trackless haulage equipment.

Mechanical Loading Problems

Mention has been made several times in the preceding pages of the Joy loaders which were brought into the mine in 1947 and 1948. These loaders and the shuttle cars brought coal handling equipment into the metal mine. The Joy loader in use is the 18HR; a more rugged loader than the 16HR commonly used in coal mines. These loaders, like any piece of newly developed equipment, have presented a number of problems which now are well on the way toward correction. The problems generally may be classed under four headings:



Shuttle car making fill at Desloge Mine No. 7

(1) Problems of maintenance due to the handling of hard and abrasive material
(2) Problems of design calling for more rugged and simplified construction
(3) Problems in personnel due to the inexperience of men chosen to operate machines or greater precision type than customarily placed in mines
(4) Problems in the mining system which had to be modified to suit the machines.

These problems are gradually being worked out with the excellent cooperation of the manufacturers.

The Joy 18HR is a mobile crawler-mounted continuous loader. It is powered by a 50-hp, a-c motor and has the following over all dimensions when ready for travel: height 63½ in., length 25 ft 4½ in., width 6 ft 10 in. The loader weighs 15 tons and travels at speeds of 63 ft and 210 ft per minute.

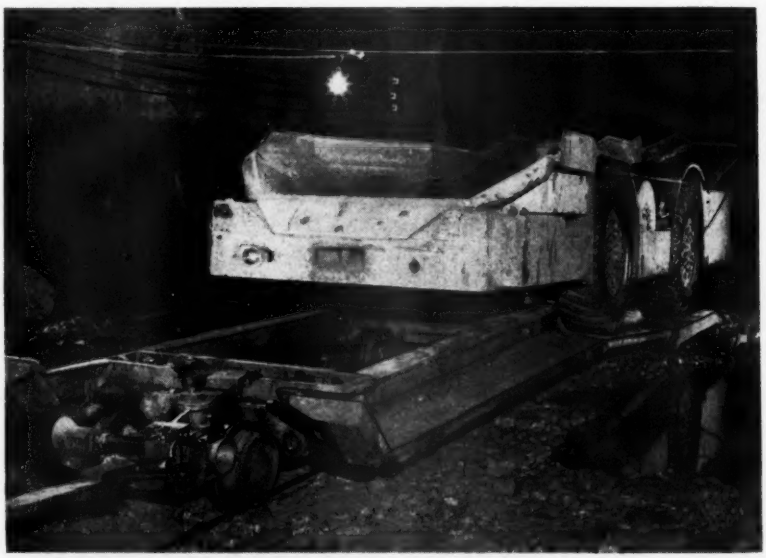
These loaders are especially convenient for loading in low ground, on steep grades and in narrow headings. Thirteen of them are now in use in the mines in various capacities of stope and development work.

Auxiliary Equipment

Much of the trackless equipment must be moved daily from heading to heading, from mine to mine and from mine to shops. The distance of move varies from a few hundred feet to several miles at times. For this purpose track mounted transfer trucks are provided. They are built to take up as little head room as possible, so that when moving equipment through drifts, the danger of brushing the trolley wire is minimized. Transfer trucks are provided for moving jumbos, St. Joe shovels, Joy loaders and shuttle cars.

In the completely trackless mines, the moving of equipment is accomplished by use of rubber-tired transfer cars.

Road working equipment also has been designed for certain locations. Since the tire wear is a function of the type and condition of the roadway, efforts are continually made to improve the roadways. Prior to the introduction of the shuttle car no par-



Jeffrey shuttle car moving onto transfer truck

ticular effort was made to keep the stope floor perfectly clean and smooth because careful cleaning with the St. Joe shovel was a time consuming job. To speed up the cleaning process for the St. Joe shovel a bulldozer blade has been made which fits over the boom of the shovel. Advancing the shovel and using its crowd mechanism to push the blade easily clears the road for shuttle car travel and also prepares the rock pile for better loading. The Joy loader in its area can itself produce a fairly good roadway as it advances in loading.

Mining Methods Change

Most of the trackless equipment fits easily into the normal mining operations, but it has been necessary to try several methods in adapting the large shuttle cars. To use a shuttle car most successfully requires its placement either in one large stope or in a group of stopes so situated that the car can reach them all readily.

Test areas are being operated at present to determine the amount of change necessary in the mining system to produce the greatest efficiency from the trackless equipment. The limiting factor in loading operations in the Lead Belt has been the ore breaking ability of the drillmen in the headings. Under the regular system a good driller can break as much as 110 tons per shift under some conditions, but the overall average for the Lead Belt is about 65 tons per shift. The average heading can be drilled and shot by the average drillman until about 200 tons are broken and piled in his heading, then the heading must be cleaned before any more drilling can be done.

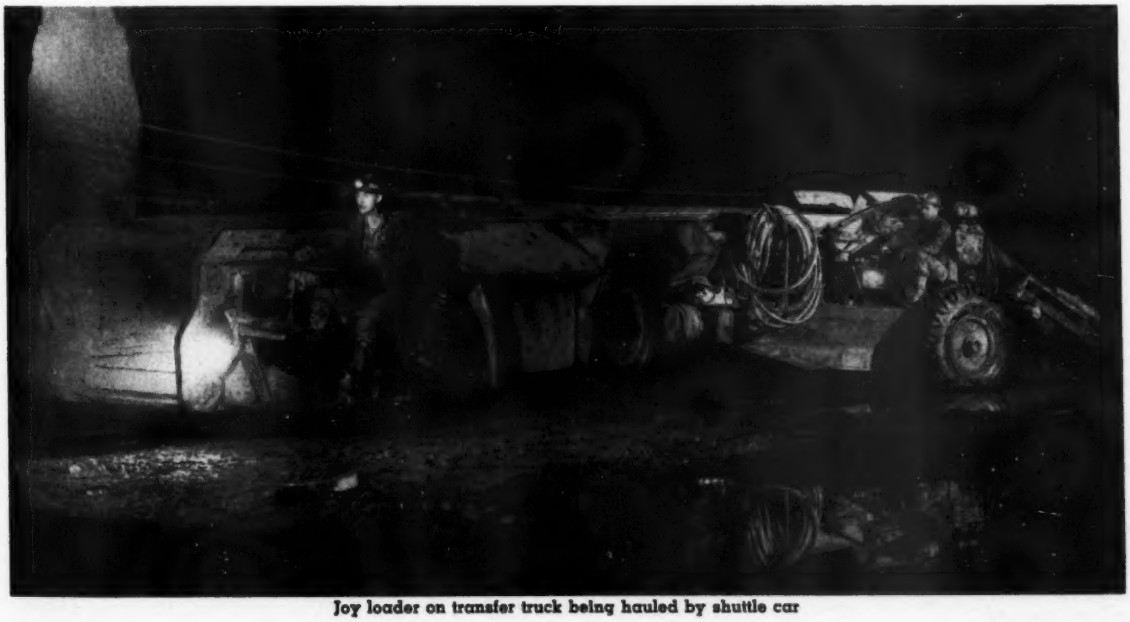
Thus, to maintain a loader at maximum efficiency a large number of headings must be provided in order that the loading unit always have broken ore ahead of it and that the driller always have free faces in which to drill. An ideal cycle would call for 12 headings in the low ground, from 8-10 ft high. Such a set-up is not generally available in the area. Some help is obtained by use of the latest drill jumbo round which blocks out a heading in a shorter time and thereby reduces the number of headings required per loader unit. This jumbo round, as developed by the experimental department, breaks about 22 tons of ore per foot of height of ground using a six hole V-cut and 26 relief and slab holes. This prepares a block of ground 25 by 10 by 8 ft in the 8 ft heading and should produce 180 tons of ore. The round generally produces a well broken pile of ore and, with the exception of the cut, all the rock is left in the heading.

Self-propelled jumbo to reach high ore

This type of mining has introduced several new problems. In order to use the jumbo round to full advantage, the full round should be drilled at each setting before the jumbo is removed from the heading. Blasting can be done only at the end of an operating shift. Careful supervision and layout of the stopes are required to prevent excessive ore dilution. The temptation to cut high, wide and handsome is great because the crews are paid on a bonus system and it is very little more trouble to break 340 tons of rock in 15-ft ground than it is to break 180 tons of ore in 8-ft ground. In the regular system of one or two drillmen per stope and three or four shovel shifts per week, a driller shift lost or gained was of little consequence to the cycle. However, in the effort to concentrate activity in one small area and to maintain high production rates it is of vital importance that delays, misbreaks and improper cycling of operations be prevented.

The problem of maintaining this high production rate in a limited area and still practice selective mining has not been completely solved. Only the most careful supervision combined with the correct preliminary development and planning will permit the operation to succeed.

One of the newly opened outlying mines, the Doe Run Mine, is a good example of the proper application of a system for using the jumbo, Joy loader, shuttle car combination. Here the ore is of better than average grade, the ore bodies are large and high, the plan of mining was laid out well in advance of mining operations and supervision is excellent.



Joy loader on transfer truck being hauled by shuttle car

Trackless Development

Insofar as the general manner of laying out development, there is little difference between track and trackless mining. The main exception is that in trackless mining some additional footage of drift must be driven for a tail track on which to pull the loaded cars past the loading ramp station. When opening up a new ore body for either system of mining, the usual practice is to drive a drift to cut the lowest recorded pay run elevation in the ore body in order to have the stope work up grade. A greater freedom in choice of grade and degree of curvature is allowed in trackless development, but an effort is still made to limit grades and curves. Drifts for trackless development are cut wider, 11 or 12 ft instead of 10 ft, than for tracked development.

Two general methods are available for cutting drift in most mines. The drift may be cut in the standard manner using any of the track mounted loading machines, such as, Eimcos, Conways or scraper ramps. In this case the track is removed after the drift is complete. The second method is to make the drift trackless from the start. Trackless equipment currently available for cutting drift are:

(1) Joy loader and shuttle car
(2) Portable ramp and shuttle car
(3) Stationary slusher hoist and scraper.

The Joy loader and portable ramp are very satisfactory for cutting drift. Perhaps the only complaint is that a unit capable of loading operating ore is tied up handling development rock. This is not a problem in drifts close to an operating heading, since the loading unit can clean the drift round in an hour or less and spend the remainder of the shift loading ore. For drifts being cut on a three-shift basis the increased loading rate has proved an advantage in giving more time for ventilation between rounds.

The stationary hoist is used for cutting drifts from trackless stopes when a Joy loader or ramp is not available. The method is not entirely satisfactory since only straight drifts may be cut economically and the maximum practical length is about 300 ft. The rock disposal problem becomes acute in long drifts if there is not a loading unit and shuttle car nearby to remove the rock occasionally. Also, it frequently happens that when the rock is piled in the stope it is difficult to keep the waste and ore separated.

The inability to do extensive development work from trackless stopes operated with St. Joe shovels and from stopes from which the Joy loader has been removed is one of the difficulties encountered in development for trackless mining.

A great deal of ingenuity has been displayed by the men in moving their heavy equipment through the old workings and up and down raises to start development in inaccessible areas. Since the loader operates on ac and the shuttle car on dc, five wires must be carried at times for power lines. An air line also must often follow when moving the cars through the old mines in order to drill sling holes for hoist blocks. One shuttle car was lowered from the surface down an old shaft to an upper level by means of a churn drill rig. The car was landed by a slusher hoist mounted in the shaft station. Cars and loaders have been helped up inclines with grades as steep as 50 percent and over 120 ft in length.

Conclusions

This is merely an outline of the use of trackless equipment in the southeast Missouri Lead Belt. A few of the possibilities have been explored. There is still much to be learned about mining methods and the different types of equipment available. The switch from track to trackless mining has not been a cure-all for the problems of the industry, nor has it done away with the necessity for careful planning. In fact, as pointed out, the concentration of equipment and productivity in one small area requires a higher degree of coordination and planning. In order to take advantage of the possibilities of the equipment much closer and more detailed planning must be done by the immediate supervisors on the job.

The greatest gain is made by the complete removal from the operating stopes of the heading track and its attendant problems. Trackless stopes can without a doubt produce more tonnage per unit and per day from small ore bodies than the previous conventional stope methods. Some of the areas in which high production rates were planned are gradually coming much closer to their goal without an undue ore dilution.

In development work the rubber-tired ramp and the Joy loader in conjunction with shuttle cars have proven to be excellent drifting combinations.

Because of the many factors involved in the installation of trackless equipment and because of the relatively short time in operation, it is difficult to make a satisfactory cost comparison between the two mining systems. However, it may be said with confidence that trackless mining in one form or another has become an integral part of the southeast Missouri operations.

AIME Minerals Beneficiation Division Holds Meeting at Salt Lake

IMMEDIATELY after the 1950 Metal Mining Convention and Exposition of the American Mining Congress in Salt Lake City, 175 members of the Minerals Beneficiation Division of the American Institute of Mining and Metallurgical Engineers held a regional meeting. The purpose of the gathering was the delivery of eight technical papers, the transaction of Division business, and last but not least, the traditional MBD Scotch Breakfast. Members of the MBD opened the meeting with the famous breakfast that features orange juice, oatmeal porridge, eggs, coffee and water, all of which are liberally flavored with ample quantities of highland dew. Extensive research is being conducted on imparting a Caledonian flavor to the bacon. Later in the day the division's business meeting considered a number of more serious topics.

S. J. Swainson suggested restricting the acceptance of technical papers to those which in the opinion of the papers and publications committee would maintain the high calibre of Institute literature. The Division was in general agreement with this suggestion.

MBD is exceeded in numbers only by the mining, geology and geophysics division and the petroleum division. Its 2814 members are 11.3 percent of the AIME registration. James Barr, Jr., outlined preliminary plans for a concerted effort to induce graduates in mineral dressing to join the division and Will Mitchell, secretary-treasurer, reported that the treasury held over $2000.

On Friday, September 1, those present at the luncheon listened to a talk by D. H. McLaughlin, president of the institute, L. E. Young and Dean Carl J. Christensen of the University of Utah. Grover Holt, presiding at the luncheon, introduced Roy E. O'Brien, new western secretary of the mining branch.

Nominations for MBD officers for 1951 were also announced: Raymond E. Byler, chairman; Edwin H. Crabtree, associate chairman; Donald W. Scott and S. D. Michaelson, regional vice-chairmen; and Will Mitchell, Jr., secretary-treasurer. Committee chairmen for 1951 will be: M. D. Hassialis, papers and publications; S. E. Erickson, membership; H. Rush Spedden, education; E. H. Crabtree, program; Norman Weiss, symposium; J. C. Lokken, concentration; W. B. Stephenson, materials handling; R. J. Russell, crushing and grinding; J. L. Weaver, solids-fluids separation; C. M. Marquardt, operating control; James H. Jacobs, solution and precipitation; F. M. Hamilton, pyrolisis and agglomeration; and S. J. Swainson and T. B. Counselman, Richards award.

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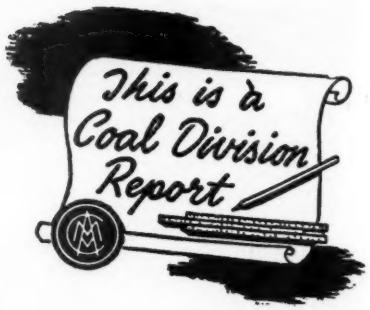
Coal Mine Power



Current Trends Show Continued Growth in the Application of Electric Power to Mining Operations

A SURVEY for the year 1949 covering a group of 177 mines in the Appalachian field gives an interesting cross section of the electric power trends in these operations. The mines are located in several states; seam heights vary from minus 36 in. to plus 6 ft; all types of loading, conveying and haulage equipment are used; they vary in size from producers of less than 2000 tons per month to operations with production of as much as 200,000 tons per month. With this variety of conditions the group covered by the survey is representative of the industry as a whole. The data presented can be considered as illustrating average practice in the use of power for coal mining.

These data are quite comprehensive, tabulating 23 different items for each of the 177 mines. They give, for each mine, the tonnage, seam height, loading and haulage equipment, the overall power situation including substation capacity, connected horse power, kilowatt hours purchased, power factors, load factors, demand and power costs per kilowatt hour as well as the number of kilowatt hours and their cost per ton of coal mined. The survey is made available through the courtesy of the West Virginia Engineering Co.* Mr. H. P. Musser, president, has submitted the following discussion on the trends indicated.

"The 1949 analysis of power costs for coal mines. . . . with its breadth and continuity of data, and the yearly consistency and trends of the average figures, is authoritative for production of coal in the Appalachian area.

"As in former years, the 1949 analysis contains columns showing the percentages of coal mined by hand and mechanically. In 1947 there were 33 mines producing coal entirely by hand loading. In 1948 this number dropped to 30 and the number for 1949 is 15. Thus the number of mines loading coal entirely by hand continues to decrease as in former years and at an increasingly rapid rate.

"In making comparisons of data with previous years, it must be remembered that while the analysis is based on the twelve months' operating data of 1949, most of the mines only operated about the equivalent of eight months, due to strikes and the three-day week in effect during a portion of the year. The fewer number of coal producing work days caused many of the companies to change position to a lower monthly tonnage class than for previous years.

"All classes of mines used greater substation capacity to produce the output, except one. This confirms the fact that mechanization has been continuing for some years, to substitute electrical power for man power. Both kilowatt demands and kilowatt hours are greater than for 1948 with no appreciable increase in tonnage. This can largely be attributed to the addition of nonproducing loads, such as cleaning plants.

"Load factor based on demand decreased in all classes except one as in 1948. One primary cause for this unfavorable trend during 1949 was the three-day work week in effect for a large portion of the year. It was inevitable for load factors to decrease when normal demands were created during three days of the week and the kilowatt hours were decreased by the short work week. Load factor based on connected horsepower is lower for all classes except one, indicating that the equipment available was used for

Table I

POWER COSTS OF COAL MINES—AVERAGES FOR TEN YEARS 1940-1949

Year	Number of Mines	Average Monthly Tonnage	Substation Capacity kw	Average Monthly kwhr Purchased	Total Cost per kwhr (Cents)	Kwhr Per Ton Coal	Power Cost per Ton Coal (Cents)
MONTHLY TONNAGE CLASS—10,000 TO 20,000 TONS							
1940	41	14,433	325	79,136	1.71	5.48	9.37
1941	50	14,955	309	79,331	1.56	5.30	8.30
1942	44	15,374	327	94,307	1.54	6.13	9.42
1943	48	15,067	334	88,799	1.57	5.89	9.23
1944	44	14,432	345	89,743	1.58	6.22	9.83
1945	43	14,443	370	85,923	1.68	5.97	9.49
1946	55	14,600	397	94,618	1.50	6.48	9.74
1947	48	14,568	393	99,781	1.53	6.85	10.49
1948	51	14,915	457	112,471	1.60	7.54	12.03
*1949	79	12,900	596	123,649	1.70	8.76	14.90
MONTHLY TONNAGE CLASS—20,000 TO 30,000 TONS							
1940	33	24,946	475	140,145	1.46	5.62	8.19
1941	27	24,945	494	144,863	1.41	5.81	8.19
1942	35	23,915	448	132,718	1.48	5.55	8.22
1943	32	24,465	461	144,159	1.43	5.89	8.43
1944	35	24,578	467	146,831	1.46	5.97	8.64
1945	36	24,585	517	153,055	1.51	6.31	9.14
1946	34	24,838	603	164,187	1.44	6.61	9.51
1947	35	24,649	526	148,860	1.44	6.03	8.71
1948	29	25,035	634	171,094	1.53	6.83	10.44
1949	20	23,683	1,038	227,047	1.53	9.59	14.70
MONTHLY TONNAGE CLASS—30,000 TO 60,000 TONS							
1940	26	42,340	732	234,603	1.37	5.54	7.60
1941	27	42,130	736	232,853	1.34	5.53	7.38
1942	39	41,151	718	233,560	1.35	5.68	7.65
1943	30	38,373	685	226,363	1.40	5.90	8.23
1944	33	38,035	643	217,218	1.39	5.71	7.94
1945	26	38,774	796	255,587	1.42	6.57	9.34
1946	20	41,824	928	280,711	1.35	6.71	9.03
1947	34	40,129	840	273,174	1.37	6.80	9.35
1948	28	37,632	869	273,095	1.46	7.25	10.57
1949	18	40,442	1,527	367,142	1.44	9.08	13.10
MONTHLY TONNAGE CLASS—OVER 60,000 TONS							
1940	12	90,090	1,417	512,358	1.17	5.69	6.63
1941	11	86,017	1,412	592,332	1.11	6.89	7.65
1942	11	74,649	1,171	459,215	1.19	6.15	7.30
1943	14	80,440	1,250	485,859	1.21	6.04	7.30
1944	15	84,557	1,420	515,405	1.21	6.10	7.37
1945	15	80,935	1,593	543,479	1.22	6.87	8.25
1946	14	80,408	1,786	557,572	1.15	6.93	7.96
1947	17	99,971	1,856	644,103	1.17	6.44	7.52
1948	19	91,210	2,134	684,028	1.24	7.50	9.27
1949	10	77,616	2,417	697,278	1.21	8.98	10.85

* Includes mines with monthly tonnage of 8,000-10,000. See explanation in text.

* Note: Copies can be furnished on request.

fewer hours in mining operations, again a result of the many idle days during the year.

"The amount of electricity required to mine a ton of coal has increased in every class except one, indicating the continued trend toward mechanization and the addition of non-coal producing load. For another year, cost of electricity per kilowatt hour has increased, largely due to coal clauses in the power tariff.

"The vital factor of cost per ton showed an increase in every class except one, a direct result of the increases in kilowatt hours per ton and cost per kilowatt hours. As electricity is utilized to perform an increasing number of operations in mining and processing coal, the cost per ton can be expected to increase, but it still remains the cheapest and most versatile form of power for coal production.

"A significant change in the analysis for 1949 is the discontinuance of the private steam plant category. Only one company listed on the sheet operates a steam plant and thus the transition, noted for many years, from the use of individual steam plants to the use of central station power is almost complete."

Table II
METHODS OF LOADING AND TONNAGES MINED IN 1949

Deep Mining Operations:			
All Mechanical Loading	49	mines produced	11,926,740 tons
All Hand Loading	5	mines produced	875,220 tons
Mechanical and Hand Loading	58	mines produced	17,794,272 tons
Deep and Strip Operations:			
Open Pit Production	15	mines produced	2,125,776 tons
Underground Mechanical Loaded			3,816,840 tons
Underground Hand Loaded			1,483,092 tons
Total	127	mines produced	38,021,940 tons

Table III
NUMBER OF MINES OPERATING BY MECHANICAL AND HAND LOADING

Year	All Mechanical Loading	Mechanical and Hand Loading	All Hand Loading	Total No. Mines	Percentage of Total: All Mechanical Loading	Mechanical and Hand Loading	All Hand Loading
1945	35	60	25	120	29%	50%	21%
1946	47	59	17	123	38%	48%	14%
1947	55	62	17	134	41%	46%	13%
1948	55	62	10	127	43%	49%	8%
1949	54	64	8	126	43%	51%	6%

TABLE IV—TONNAGE MINED BY MECHANICAL AND HAND LOADING

Year	Method of Loading: All Mechanical	Mechanical and Hand	All Hand	Total Mechanical Loading	Total Hand Loading	Total Tonnage	Percentage of Total: Mechanical Loading	Hand Loading
1945	11,700,000	11,000,000	14,600,000	6,500,000	22,700,000	21,100,000	43,800,000	52%	48%
1946	15,800,000	10,100,000	13,450,000	3,950,000	25,900,000	17,400,000	43,300,000	60%	40%
1947	19,400,000	15,400,000	16,000,000	4,700,000	34,800,000	20,700,000	55,500,000	63%	37%
1948	17,700,000	15,100,000	15,700,000	2,800,000	32,800,000	18,500,000	51,300,000	64%	36%
1949	13,900,000	11,600,000	9,200,000	1,100,000	25,600,000	10,300,000	35,900,000	71%	29%

Mining Methods and Tonnages

Mr. Musser's summary needs no elaboration. It is an able discussion of the highlights indicated by the survey data. Space limitation do not permit reproduction of the data sheet but since the figures are of general interest, extracts together with some breakdowns, are presented.

Although the complete survey covers 177 mines the discussion here will deal with mechanization trends as indicated by the larger producers. In previous discussions "larger producers" were considered to be those mines which had an output of 10,000 or more tons per month. In order to compare the present trend with the past records of these same mines, it is necessary to make some adjustment in the 1949 classification to compensate for the over-all tonnage loss of last year. Accordingly, the production limit for 1949 is lowered so as to include those mines which had a tonnage of as much as 8000 tons per month. This gives a group of 127 operations with an annual output of approximately 38,000,000 tons representing more than 90 percent of the tonnage of the entire survey.

On this basis, Table I is a compilation of the averages over the past ten years showing the major items of tonnage, power purchased and power costs. The tonnage was produced by several methods—some mines were all mechanical loading, a few were still on a 100 percent hand loading basis while the remainder used a combination of hand and mechanical methods. A summary of the tonnages mined by the various types of operations is given in Table II. Those mines which produced as much as 90 percent of their output with mechanical loading are put in the all-mechanized class, as the small amount of hand loading done was usually incidental and confined to isolated entries or clean-up sections.

In Table II it will be noted that 15 mines were operating open pits—one mined entirely by stripping while the other 14 combined deep and strip mining. This group produced a total of around 7,000,000 tons; approximately 2,000,000 tons of this was from open pits while the remaining 5,000,000 was from deep mining. The 2,000,000 tons of strip coal constituted only five percent of the total production of the survey and since this article deals primarily with methods of deep mining, the open-pit operations will not be considered further and their tonnage is not included in the tabulated data. However, the deep mined tonnage (5,299,932 tons) of this group is included with the tonnage of the other deep mines compiled in Table III and IV, and a breakdown of their loading methods is as follows:

All Mechanical Loading
5 mines produced 1,951,548 tons
All Hand Loading
3 mines produced 277,800 tons
Mechanical and Hand Loading
6 mines produced 3,070,584 tons

The figures in Tables III and IV need no interpretation but it might be well to explain the classifications used. "All mechanical loading" includes the mines that loaded more than 90 percent of their tonnage with machines; "mechanical and hand loading" includes those that loaded any tonnage mechanically up to 90 percent of their total output; "all hand loading" includes those which had no tonnage loaded by machines.

The trend towards complete mechanization continues. This is evidenced by the percentage figures in Table IV showing that mechanical loading now produces 71 percent of the tonnage mined underground. In Table III however it will be noted that the number of mines using mechanical loading has remained stationary. This is partly due to the idle time in 1949 which discouraged expenditures for equipment. With increasing production it can be expected that modernization progress will be resumed.

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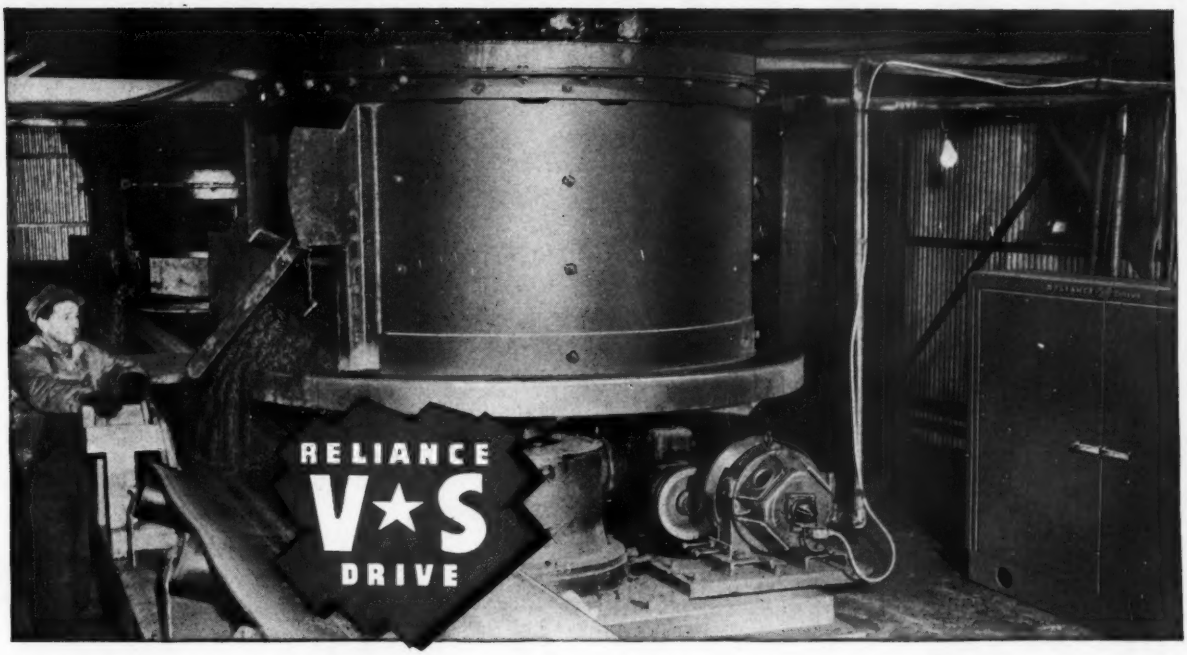

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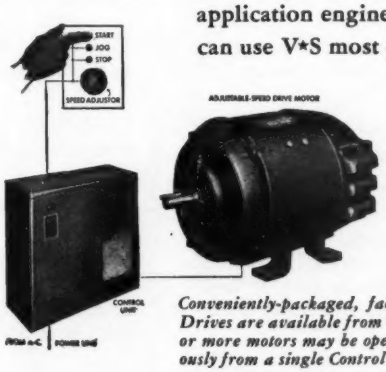

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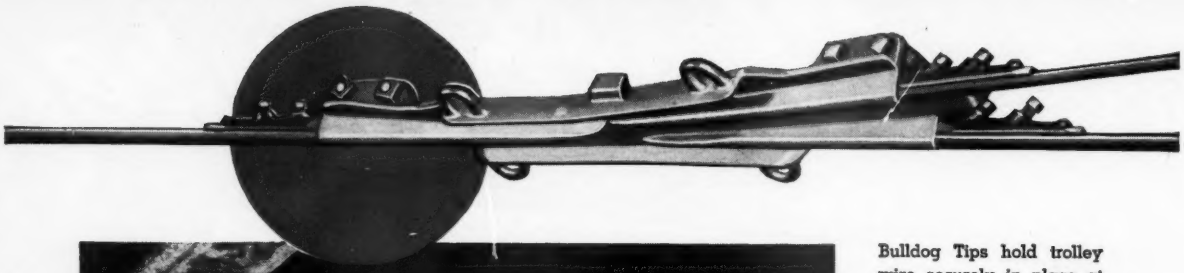
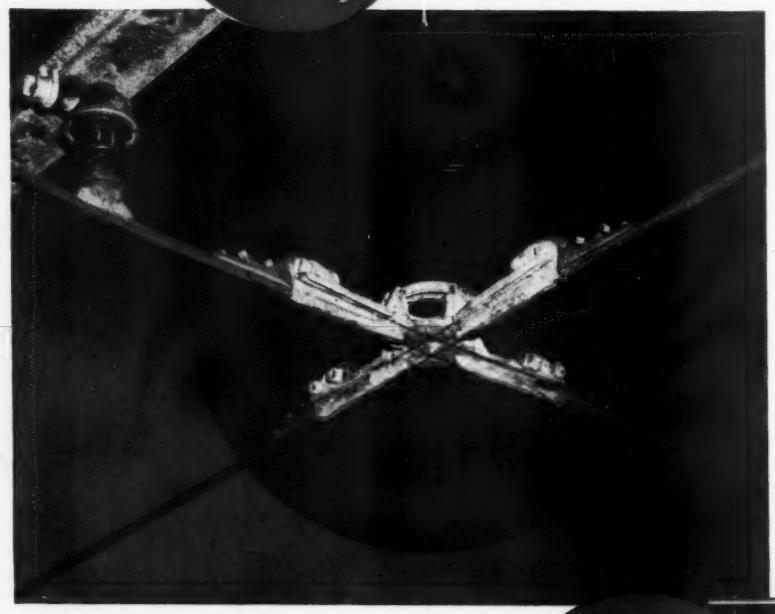
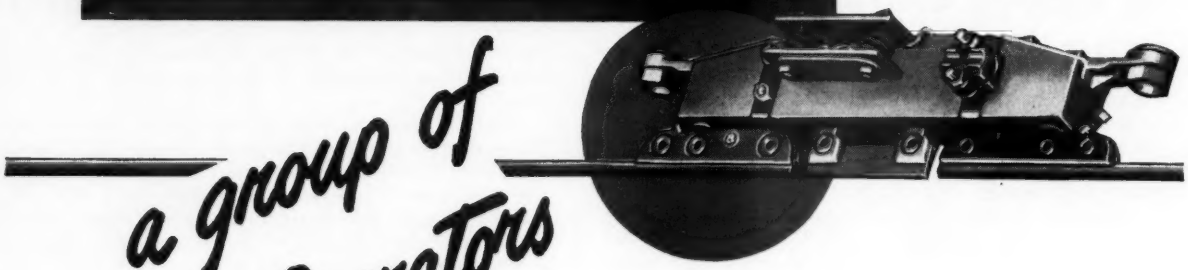




Bulldog Tips hold trolley wire securely in place at the approaches to Frogs and Crossovers without interfering with the wire-smooth collector path.

Trolley wire enters Section Switches and Insulators through End Runner Clamps which provide a single-level collector path.



a group of Smooth Operators

That's what these O-B Overhead Trolley Fittings are, and their success is largely due to their smooth approach! It's all in the way in which the collector is led into and away from the fittings. Bulldog Tips and End Runner Clamps grip only the upper lobe of formed trolley wire without changing the level of the collector path; without obstructing the path in any way.

With no wire-encircling grip; with no jog between the wire and the fitting, the collector enters and leaves any O-B Smooth Underrun Fitting on a wire-smooth, wire-level path.

This is the "Smooth Approach" for smooth operation!

Specify O-B for your overhead trolley fittings, and you'll have the right approach to the problem of maintaining trouble-free current collection in your mines. No arcing, bumps or rough spots anywhere in an O-B overhead system of smooth underrun fittings. An O-B representative will be glad to help select the equipment needed for your particular haulage way.

4056-M

Ohio Brass

MANSFIELD OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD. NIAGARA FALLS, ONT.

service life increased 5000% with AMSCO® Hardfacing!

Post Hole Digger now digs 206 holes in rocky soil before repointing

Just 4 holes was the former life of a new point and blade on this power-driven post hole digger. After hardfacing with AMSCO Tube Tungsite, the same blade and point dug 206 holes—*51 times the former service!*

Here's another example of big savings with AMSCO Hardfacing . . .

Lips and teeth of this dipper were given far greater resistance to impact and abrasion with AMSCO Economy Hardface . . . resulting in longer dipper life, lower handling costs per ton.

These are typical examples of tremendous savings made with AMSCO Hardfacing . . . savings in time, maintenance and money! Wherever *any kind of part*—from huge mining dippers to small drill bits—is subjected to impact or abrasion, you'll find that it pays to hardface with AMSCO Welding Products.

Where to look for money-saving hardfacing applications:

On parts subject to wear by abrasion, impact, heat or corrosion, such as:

Earthmoving Equipment • Farm Equipment Oil Field Drill Bits • Sprockets • Dredge Pump Shells • Materials Handling Equipment • Pulverizer Hammers • Punching, Trimming, Forging Dies • Coal Cutter Bits.

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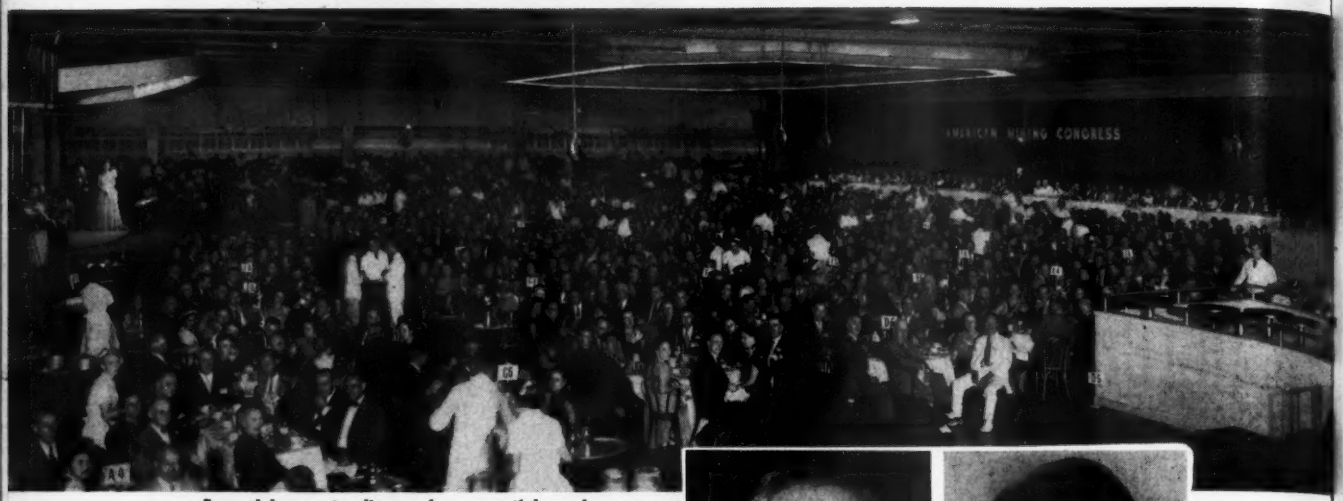
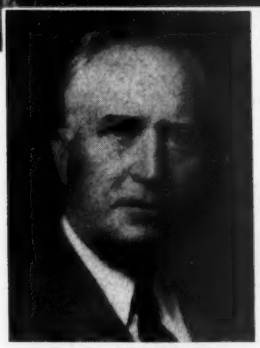


Annual banquet—climax of an eventful week



D. D. MOFFAT,
Chairman, Western Division, A. M. C.

ROY A. HARDY,
National Chairman, Program Committee

Record Convention Held in Salt Lake City

WITH an all-time high of 5453 mining men and their ladies registered at the 1950 Metal Mining Convention and Exposition in Salt Lake City, August 28-31, even the most optimistic expectations for this outstanding meeting were surpassed. Eleven years had passed since the previous American Mining Congress Convention and Exposition was held in Salt Lake City. At that time there was the threat that we might be drawn into an international struggle; on this occasion we were already engaged in a critical conflict in Asia. The increased demand for metals and mineral raw materials impossed by war focused the attention of all Americans on convention proceedings that pointed the way towards increased output.

Supplementing the comprehensive discussions at the general and operating sessions of the convention, an exposition of mining machinery, equipment and supplies of unprecedented interest and size was assembled at the State Fair Grounds. The great variety of the exhibits, featuring tools and accessories for every mining operation, demonstrated that both the manufacturing and the production ends of the mineral industry are striving towards continued progress, higher efficiency and greater safety in every phase of mining and milling operations.

To highlight major industry problems, a national Program Committee under the chairmanship of Roy A. Hardy arranged a series of 13 sessions; seven devoted to subjects of general interest such as the outlook for metals, stockpiling for national defense, tariff and taxation, safety and labor relations, foreign aid, monetary problems, public land policies, problems of the small mine operators, atomic energy developments, and public relations. Six sessions covering special phases of ore production were designed to accent new methods and practices. Among the topics included in this important section of the program were "packaged" timber handling; operating factors in Heavy-Media separation; a symposium on rod mill liners; geochemical prospecting; roof bolting; trackless mechanized mining; problems of underground rock breaking; rock drill bits and drill steel; open-pit mining; and progress reports of developments at Howe Sound's new cobalt mine, and at the Copper Range Co.'s White Pine deposit.

Local committees which laid the groundwork for this exceptionally fine meeting also deserve the highest praise of the mining industry for the result of their efforts. D. D. Moffat, chairman of the Western Division of the American Mining Congress and general chairman of the Salt Lake Committees, and James K. Richardson, vice-chairman of the local committees, deserve special commendation. In equal measure R. D. Bradford and Walter M. Horne, chairman and vice-chairman of the general arrangements committee; Paul H. Hunt and A. G. Mackenzie, chairman and vice-chairman of the trips committee; Louis Buchman and E. W. Englemann, chairman and vice-chairman of the publicity committee; E. H. Snyder and Otto Herres, chairman and vice-chairman of the Exposition committee; Mrs. O. N. Friendly and Mrs. L. H. Hart, chairman and vice-chairman of the ladies' committee; F. A. Wardlaw, Jr., and James W. Wade, chairman and vice-chairman of the reception committee; and the many members of

these committees merit high praise for their splendid cooperation in planning and concluding arrangements that were the foundation for the highly successful meeting.

Special commendation for a fine job goes to the Housing Committee, under the capable chairmanship of W. C. Page, vice-president and general manager, U. S. Smelting Refining & Mining Co.

It was early recognized that the huge crowd expected for this meeting would tax Salt Lake's facilities to the utmost, and that there would be many problems involved until the last visitor checked in. Under Mr. Page's guidance, the many personal contacts with the hotels and motels, the voluminous correspondence with applicants throughout the country, and the resolution of the perplexing problems that arose were handled capably, efficiently and with extraordinary tact by Ward Tuttle, assistant manager, Industrial Relations Department, U. S. Smelting Refining & Mining Co.

Following the procedure so successfully instituted at Spokane in 1949, the Resolutions Committee began its work on Saturday, August 26, and by late afternoon Sunday, August 27, had completed the drafting of a strong Declaration of Policy, representing mining's views on matters of national concern affecting the industry and the defense program. The membership of the committee and subcommittees had been widely publicized to the industry in order that all mining men might have an opportunity to express their views. Resolutions were submitted at each of the general sessions for discussion, and it is a tribute to the careful and considered draftsmanship of the committee that they were all adopted unanimously.

Secretaries' Conference

With Walter Horne, acting manager of the Utah Mining Association, presiding, the annual meeting of the mining association secretaries took place Sunday at the Hotel Utah. Topics discussed included proposed state and Federal legislation, public land policies, exploration and development incentives, public relations matters, and closer coordination of the work of the individual associations.

Mining Stands Ready

Mining men began to flow into Salt Lake City on Sunday, August 27, and registration of convention delegates was in full force on Monday morning as huge throngs descended on the State Fair Grounds to attend the formal opening of the 1950 convention.

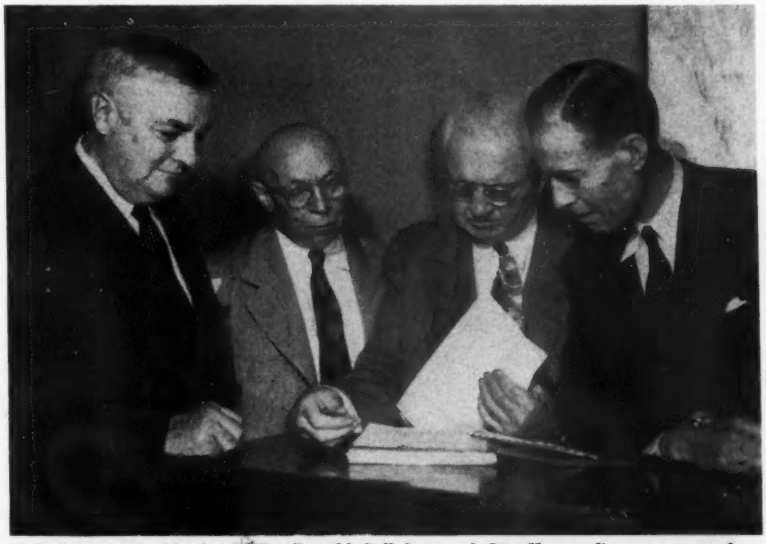
Julian D. Conover, secretary of the American Mining Congress, opened the convention proceedings. After referring to the fact that the last meeting of the organization in Salt Lake City 11 years ago was held on the eve of World War II, he said: "Today we're in another world crisis. We hope and pray it's not the first stage of World War III. But we know that, whatever it portends, the mining industry must be ready to do its part as it did in the last emergency. . . . Today we face even greater obstacles in getting the industry as a whole back into high gear. Here in the West the number of producing metal mines has been cut by nearly four-fifths, and the old-time urge to prospect for and develop new mines has been sadly reduced.

"Our present tax structure which leaves all too little incentive to develop new mining properties; the erosion of our tariff protection through foreign trade agreements and currency devaluations, while foreign producers receive direct aid from our own government; a wage structure forced out of line with metal prices by inflationary wage policies; neglect and discouragement of our small but vitally important strategic mineral industries; and continued growth in government controls that hamper initiative and make 'paper work' more important than 'putting rock in the box'—all these have contributed to the difficult conditions which we face today.

"These obstacles affect the large operator, and even more so the small operator who is the real mainstay of a healthy and developing mining industry. Looking to the future, nothing is more important than to restore the incentive, to both small and large operators, to take the risks of making prospects into mines. Ex-President Hoover recently spoke of mining as a 'jack-pot' industry—and no one is going to try for a $20 jack-pot if he can only keep $2 of it.

"So the keynote of our meeting this week is how to get the production—and the future production—of metals and minerals necessary to keep our country strong." He went on to say that this problem was being considered from two major aspects: First, as to the over-all government and industry policies that will permit the industry to meet its responsibilities; and secondly, as to means of further

W. C. Page (*right*) **and Ward Tuttle, of U. S. Smelting Refining and Mining Co., successfully tackled the difficult task of housing convention delegates**



Robert Searls, Charles Willis, Donald Callahan and Otto Herres discuss proposed resolutions

Interested delegates thronged the meeting rooms . . . .

stepping up production with the manpower available—through greater mechanization and improvements in practice all along the line.

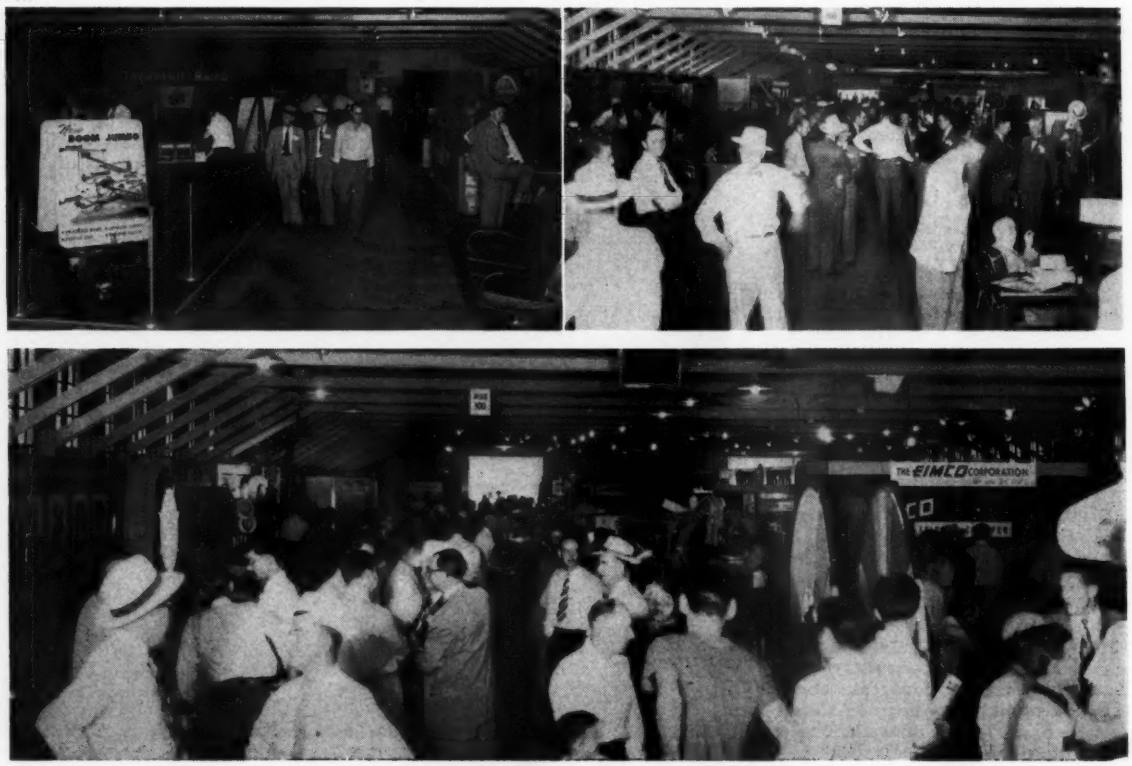
Mr. Conover turned the meeting over to Frank A. Wardlaw, Jr., who conducted the first general session on the state of the industry.

Among the featured speakers during the week were Representatives Clair Engle of California; Graham Barden of North Carolina; Carl Durham of North Carolina; Assistant Secretary of Interior C. Girard Davidson; Bureau of Mines Director James Boyd; R. L. Wilcox, director of ECA's Nonferrous Metals Branch; Col. Earl Payne of the Munitions Board; Lawrence R. Hafstad, director of the U. S. Atomic Energy Commission's Division of Reactor Development; and Jesse C. Johnson, manager of AEC raw materials operations.

Welcoming Luncheon Features Notables

Monday noon the Coliseum at the State Fair Grounds, site of the exhibits of the 1939 Convention and Exposition, was the scene of the Welcoming Luncheon. With D. D. Moffat presiding, Mayor Earl J. Glade of Salt Lake City extended a hearty welcome to Utah to the convention delegates. His kind invitation to enjoy the scenic and civic attractions of Salt Lake City and the State of Utah was warmly seconded by J. Reuben Clark, Jr., ranking officer of the Church of Jesus Christ of Latter Day Saints.

Howard I. Young, president of the American Mining Congress, responded to these greetings and voiced his pleasure in being in Salt Lake City to



. . . . and spent many hours inspecting exhibits

participate in the meeting marking the 53rd year of the Mining Congress. Mr. Young reaffirmed the forward-looking policy of the American Mining Congress in its service to the mining industry, to help keep it in top condition to obtain maximum output with a minimum of Government controls. Roy A. Hardy, National Chairman of the Program Committee, expressed his appreciation for the cooperation of all who helped to develop a convention program of outstanding interest. M. L. McCormack, Chairman of the Manufacturers Division, cordially invited all Convention delegates to study the largest and most complete exposition of mining equipment ever assembled for the attention of mining men. Mr. McCormack marked the American Mining Congress as an organization devoted to mining progress where operators and manufacturers can play an equal part in forwarding the best interests of the industry.

Governor J. Bracken Lee of Utah, as guest speaker, urged that America develop a sound society based on truth and justice. He advocated realignment of the nation's two major political parties; he deplored the growth of Federal bureaucracy and the loss of state's rights.

Good fellowship prevailed at the Welcoming Luncheon enlivened by the appearance of "vigilantes" from Bingham who made the hall echo with their six-gun fusillade.

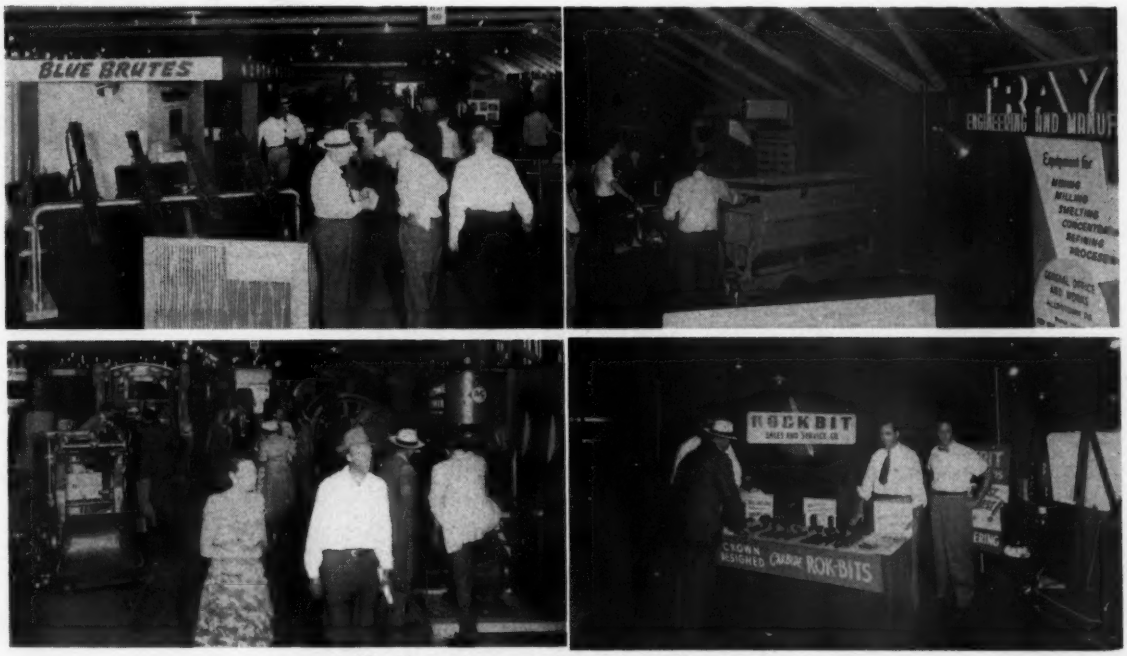
Fred Mulock, Frank Wardlaw, Ed McGlone, Doug Moffat and Julian Conover talk things over

Unequalled Exposition

Exhibits by 127 leading manufacturers of machinery, tools and supplies for the various operations of the mining industry were a key attraction at the State Fair Grounds. Almost 38,000 sq ft of space were occupied in displaying the most modern and efficient equipment for finding, exploiting, and beneficiating our mineral resources. Manufacturers' representatives had little rest as operating men plied them with requests for detailed information on the most effective application of their products.

All previous Expositions held in the West were exceeded by the superlative show staged at Salt Lake City. Any attempt to describe the great variety of exhibits could not do full justice to the many items on display which were classified under 70 headings. These ranged from air cleaners and filters through batteries, belts, bits, compressors, conveyors, drills, engines, excavators, hoists, loaders, mine cars, pumps, switches, tracks, tramways, ventilating equipment, wire rope and many other products for application in mining and milling plants.

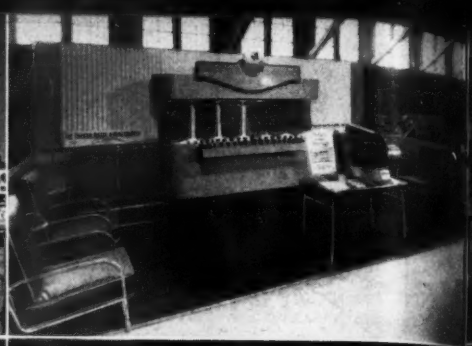
Exhibits were located in four spacious buildings of the State Fair Grounds and in booths arranged in an adjoining area. Both exhibit content



Manufacturers representatives had a busy week

MARION

ALLIS-CHALMERS



AS POWDER CO.

OHIO BRASS

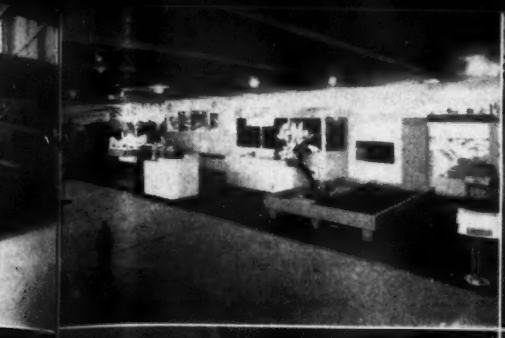
LE ROI COMPANY
CLEVELAND ROCK DRILLS

AMSCO

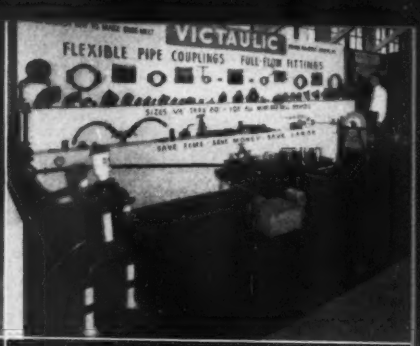
MOLY-C

Kennametal Rock Bits

HARDINGE



ELECTRIC SERVICE


VICTAULIC
FLEXIBLE PIPE COUPLINGS FULL-FLOW FITTINGS

CHICAGO PNEUMATIC TOOL CO.

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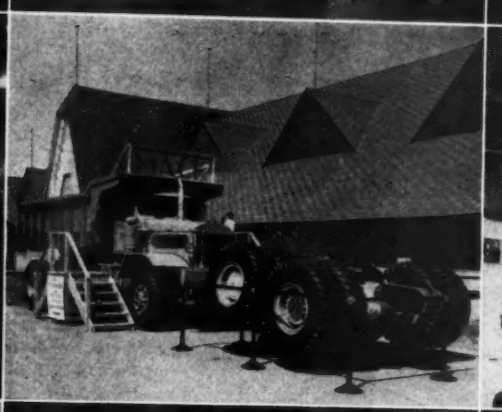


MANCHA
DIVISION

Brunch for the ladies on the Utah roof

and arrangement demonstrated unusual ingenuity. Many displays featured new developments of special interest to operating men and a large number had equipment in actual operation to demonstrate its application.

Keen interest was shown in the show which at all times was packed with information-seeking miners.

Special Conferences

Thursday afternoon featured special conferences on taxes, gold, strategic minerals and public lands. At noon a luncheon meeting was held by the Board of Governors of the Western Division of the Mining Congress, under the chairmanship of D. D. Moffat. A report of activities was given by Secretary Conover and the Board confirmed plans to hold the 1951 Convention, without exhibits, in Los Angeles, October 22-24. An invitation to meet in Denver in 1952 was received with appreciation and will be acted on at a later date.

Harvey S. Mudd, noted mining engineer and executive of Los Angeles, was nominated as chairman of the Western Division for 1951 and was unanimously elected.

"Galena Days" Celebration

On Monday evening, after profitable hours spent at business sessions and in inspection of the many exhibits, Convention delegates and their ladies embarked for Bingham Canyon to take an active part in the "Galena Days" celebration, characterized by fun and high spirits all around. Refreshments and hot meals were served on the 6190 level of the renowned open-pit of Kennecott's Utah Copper Division.

Thus fortified, groups and couples went downhill to the town of Bingham to enjoy the many festivities reviving the rugged days of a half century ago. Many enjoyed dancing at Gemmill Hall until late in the evening when buses arrived to take the weary celebrants back to Salt Lake City.

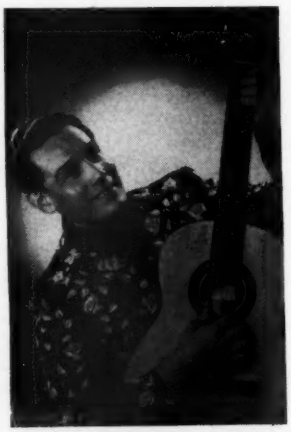
No organized entertainment was scheduled for Tuesday evening and mining men were free to spread all over Salt Lake City to enjoy the hospitality of the town and meet with friends to exchange ideas.

Mining Jamboree

Following Wednesday's daytime activities, Convention visitors again embarked on buses in the evening to move out to Lagoon, Salt Lake's attractive amusement park. Refreshments were served in the gala playground atmosphere and a delicious steak supper was the prelude to an evening of good fellowship and fun. All facilities of the amusement center were open for the enjoyment of the mining men and ladies. Many danced while others sampled the rides and side-show features of the playground.

Annual Banquet Closes Meeting

The annual banquet, as usual, was a fitting climax to the activities of the convention. At Salt Lake, this top



Tito Guizar starred at Annual Banquet

function of the mining year was held on Thursday evening in the Rainbow Randevu, one of the nation's largest ballrooms. A splendid dinner, ably served by the staff of the Hotel Utah, was followed by the introduction of head table guests by Donald A. Callahan, vice-president of the American Mining Congress—42 presidents and other top officials of the country's leading mining companies. A troupe of talented entertainers from Hollywood, headed by the noted artist Tito Guizar, performed for more than an hour prior to turning the evening over to dancing.

Special Fun for the Ladies

The presence of the ladies added much to the success of the Convention. They not only took part in the regular Convention functions, but also enjoyed the special entertainment arranged to occupy them while the men were busy at the Fair Grounds.

On Tuesday a tea and reception was held at the home of Mrs. C. C. Parsons. Wednesday morning the ladies enjoyed a brunch on the Hotel Utah roof followed by an organ recital at the L. D. S. Tabernacle. A special trip on Thursday took them to points of interest in Salt Lake City, including Memorial Grove and "This is the place" monument; followed by a picnic luncheon in Mill Creek Canyon.

Field Trips Follow Meeting

Plane trips were made on Friday and Saturday, passing over Bingham Canyon, Tooele, the Tintic-Eureka district and Park City, as points of interest were described by geologists familiar with the region. On Friday some 70 persons made a trip to the Geneva Steel works where they were conducted on a special tour of that great $200,000,000 plant. On Saturday buses took a group of nearly 90 for a trip to the Garfield smelter, the Magna and Arthur mills and Kennecott's new electrolytic refinery, winding up with a visit to the open-pit operations at Bingham.

Special Pullman cars on the Denver & Rio Grande Western took an interested group to visit the oil shale project of the U. S. Bureau of Mines at Rifle, Colo. This train was fueled with shale oil, the first train ever to be powered by oil produced from this unique and interesting project.

Above, in brief, is a report of an outstanding week of the mining year, a week climaxing a year of cooperation, a week of the interchange of ideas and the laying of coordinated plans for future activity. A mere recounting of the events, no matter how detailed, could not possibly do justice to the meeting. Every one of the more than 5000 who attended the 1950 Metal Mining Convention and Exposition can give testimony to the success of efforts aimed at solving industry problems. Mining now goes forward to better fulfill its obligations to provide America with the sinews of industry in war and in peace.

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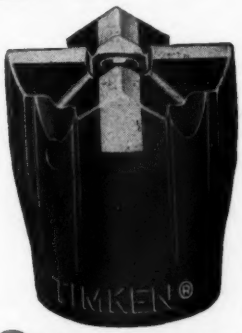

2 CARBIDE INSERT

...and a complete Rock Bit Engineering Service!

3 ONE-USE "SPIRALOCK"

HERE'S real help in getting the *best* removable rock bit for your particular drilling job! Whether you're looking for lowest bit cost, lowest cost per foot of hole, greatest possible drilling speed, or any other advantage, you're sure of getting it with the Timken® Rock Bit Engineering Service. That's because Timken offers *all three* types of bits:

1 **MULTI-USE**—gives lowest cost per foot of hole when full increment of drill steel can be drilled and when control and reconditioning of bits are correct.

2 **CARBIDE INSERT**—for extremely hard and abrasive ground. Drillers spend less time changing bits.

3 **ONE-USE "SPIRALOCK"**—for use where reconditioning is impractical or undesirable. Lowest unit cost. New "Spiralock" union.

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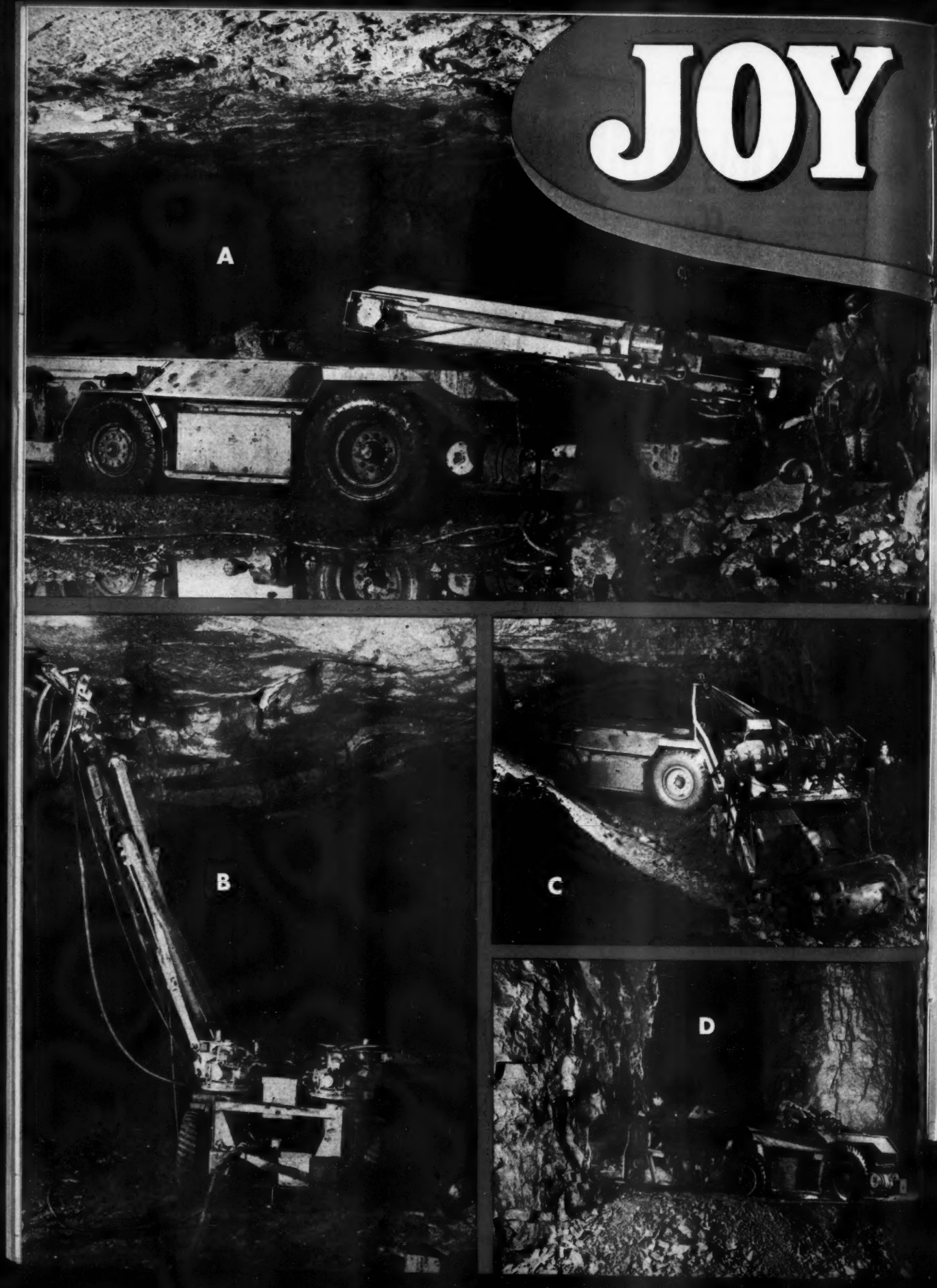
JOY
A
B
C
D

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. . . does the *DRILLING, LOADING* and *HAULING JOBS* with *TOP EFFICIENCY*

JOY DRILLMOBILES

In photograph B on the facing page, the long reach of a JOY Drillmobile is being utilized in taking down back. These rubber-tired, self-propelled, twin-boom units are setting new standards of fast, low-cost drilling in modern trackless mining, both in the metal and non-metallic fields. JOY Drillmobiles are fast-tramming, highly maneuverable machines, available in three sizes for work in any size heading or in stopes where the grade is not too steep. Drills can be equipped with long feed or standard drifter cradles and are mounted on JOY Hydro Drill Jibs, which make hole-positioning easy and accurate, and permit remote control for maximum safety. ● *Write for Bulletin 87-F.*

JOY 18-HR-2 LOADERS

Photograph A at the top of the page at left shows a JOY high capacity, continuous-type Hard Rock Loader in operation, loading into a JOY Shuttle Car in one of the mines of the Southeast Missouri Lead Belt. This heavy-duty, crawler-mounted machine loads up to 12 tons per minute, producing high tonnage at low cost in trackless mining. It is ruggedly built to handle hard and abrasive rock and ores. The JOY gathering mechanism (not shown in the picture) assures top efficiency, and the chain conveyor swings 45° to either side of center to meet various loading requirements. A smaller model, the JOY 17-HR Loader, is built for use in more restricted areas. ● *Write for Bulletin J-108.*

JOY SHUTTLE CARS

The versatility and flexibility of JOY Shuttle Cars in metal and non-metallic trackless mines is well illustrated by the photographs on the opposite page. In photos A and C, JOY Model 60 Shuttle Cars are shown being loaded by a JOY Hard Rock Loader and a scraper, respectively; and in photograph D, a car is shown making fill. JOY Model 60 Shuttle Cars (up to 14 tons capacity) are designed to give you rapid and low-cost transferring of rock and ore from loading points to main haulage systems. They are ruggedly-built; fast-tramming cars, with conveyor bottoms to speed loading and unloading and are available with hydraulic cable reel, trolley or diesel drive to suit operating conditions. ● *Write for Bulletin J-200.*

JOY SLUSHERS

In photograph C on the facing page, a JOY electric motor-operated three-drum Slusher is shown mounted over a scraper ramp, which in turn is mounted on a JOY Drillmobile chassis for easy maneuverability in a Southeast Missouri mine. JOY Slushers are available in a full range of two and three-drum models, including air or electric-powered types, adaptable for automatic or remote control if desired and built for heavy duty with low maintenance. Allied JOY equipment includes a complete line of air, electric or gasoline engine-powered single-drum Hoists, Air Motors and Winches, Carpullers and Ropepullers, Sheave Blocks and Scrapers. ● *Write for Bulletin 76-Y on JOY Slushers and Bulletin 76-X on JOY Hoists.*

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RUBBER-CORED GROUND—Securityflex Type G 600-Volt Mine Cable also provides the famous patented rubber-cored ground wire construction. The rubber core provides larger ground wire diameter, and reduces tendency of the grounding wires to cut the cable conductor insulation.

FIRM SUPPORT GIVES PROTECTION—An additional advantage of rubber coring is the cushioning support it gives every wire in each ground wire strand against displacement and damage when the cable becomes twisted.

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The right cable for the job ANACONDA® WIRE AND CABLE

Abstracts of Convention Papers

Brief digests of talks delivered at the Convention are presented here. A number of the papers have already been published and future issues of Mining Congress Journal will feature the full texts of many of these informative addresses.

THE STATE OF THE INDUSTRY

Session Chairman

F. A. WARDLAW, JR.
General Manager
International Smelting & Refining Co.

Outlook for the Nonferrous Metals and for Silver

By SIMON D. STRAUSS
Vice-President
American Smelting & Refining Co.

FROM the violent swings of metal shipments over the past two years, and the shipping declines in the spring of 1949, one would think that the country had suffered a serious depression at that time. But the Federal Reserve Index of general industrial activity dropped only 17 percent. Buyers' strikes by prefabricators of metal dropped copper from 23½¢ to a low of 16¢, whence it has recovered to its present level of 22½¢. Zinc dropped from 17½¢ to 9¢, and is now back to 15¢; lead dropped from 21½¢ to a low of 10½¢ and is now 13¢.

Feverish buying periods have alternated with those of complete disinterest. Many miners feel that the solution is relatively simple; all that needs to be done is for metal sellers to make it quite clear they will not cut prices. However, financial resources of the sellers of metals—both the large producers and custom smelters—will not permit accumulation of unsold quantities while waiting for customers. The custom smelter is obligated to buy ore from miners regardless of its ability to sell the metal content. Purchasing agents of consuming companies unfettered by contracts can conduct buyers' strikes.

Miners appreciate the advantage of prompt cash settlement for ores and concentrates. The smelter's ability to do this depends on maintenance of a sound financial position; which means balanced intake and sales. When intake exceeds sales, the only recourse is to drop the price in the hope of increasing sales. Even so, the custom smelters accumulated large tonnages of copper, lead and zinc during the first half of 1949; substantial losses were incurred in the subsequent liquidation of these inventories.

The Munitions Board, which determines the time and extent of stockpile purchases, feels that its program should be governed primarily by military considerations. Copper buying has been maintained at a fairly constant rate, but the lead and zinc policy has caused real damage to the industry and has not promoted true defense objectives.

Today the domestic copper industry is operating at capacity. The lead-zinc industry is increasing mine production under the incentive of rising markets. We cannot count on much greater imports than the amounts we have been receiving for the last three or four years.

If military requirements are to be met, either the rate of stockpiling must be slowed down or civilian requirements reduced. If Government chooses to increase stockpiles at the expense of civilian consumption there are three ways to do this: (1) civilian buying can be reduced at the source by prompt and courageous tightening of credit controls; (2) a quota system to limit production of cars and appliances could be set up. This would be more difficult to administer; (3) the Government can go directly to allocations and price controls and become involved in elaborate bureaucracy and enforcement difficulties.

World production of silver is declining as consumption for other than coinage increases. The fate of the silver market continues to rest on political rather than economic factors.

Perpetuation of the Domestic Mining Industry

By PAUL H. HUNT
Vice-President & General Manager
Park Utah Consolidated Mines Co.

THIS article was published in full in the September issue of MINING CONGRESS JOURNAL.

The Problems of the Small Mine Operator

By HONORABLE CLAIR ENGLE
Member of Congress from California

LEGISLATIVE relief for the small mine operator has been difficult to obtain because of: (1) the beliefs of some Government agencies that U. S. mineral resources were grievously depleted by war; that our remaining resources should be conserved by keeping them in the ground; and that we should rely on foreign imports so far as possible; (2) the dollar-balance policy of the State Department; and (3) differences in opinion within the mining industry.

From a legislative standpoint, the problem before the small mine operator is to convince Government executive agencies (1) that ore begets ore; (2) that mining and developing our mineral resources is conservation; and (3) "that American dollars paid for foreign minerals and metals has a Siamese twin—a dangerous and costly dependence upon ocean-borne supplies."

It is also essential that the people of the East and South must be convinced that the security of their farms, factories and homes requires a self-sufficiency of those things without which our industrial machine will collapse. Differences within the mining industry must be eliminated in the national interest.

That our domestic mining industry is slowly going out of existence; that the stockpile is deplorably short and unable to sustain any kind of a war effort; that we are tragically lacking in some of the very essentials of a war effort, has been made plain by the Korean crisis.

sort of problem requiring attention if we would reestablish international trading on a basis consistent with the American system of private capitalism and individual freedom.

Two World Wars and a great depression have complicated the monetary policy problem. On the world economic scene there is a continued drift toward intense nationalism, closed economic systems, managed inconvertible currencies and various degrees of nationalization of enterprise and trade control.

The development of fiscal policy in the past decade grew out of monetary policy and was designed to supplement and strengthen it. Fiscal policy has ended up by threatening to supplant monetary policy altogether. Military activity in Korea imposes new fiscal problems and a new concern about inflation. Selective credit controls directed toward restraints on installment buying have been adopted or planned. At the same time it would be appropriate for the government to curtail its own non-essential expenditures.

To achieve the necessary "pay as you go" status required for a sound fiscal and monetary policy, we must prepare for higher income taxes plus heavier and wider excise taxes; turn the tide against deficit financing and the progressive deterioration of the dollar.

Financing of the government deficit through increased borrowing from the banking system should be kept at an absolute minimum. Our inconvertible currency encourages continuing deficits and a growing public debt; it penalizes the thrifty and places ever-expanding drains upon the public treasury. A free world market in gold would do more to stabilize the currencies of all countries than anything else.

The United States is the one country which still posesses the largest measure of individual freedom in private and business affairs and we should thoroughly reexamine our whole monetary situation and fiscal policies for the purpose of determining a course of action that will carry with it a better prospect for long-term progress.

MONETARY POLICY FOREIGN AID

Session Chairman

DONALD H. McLAUGHLIN
President
Homestake Mining Co.

A Sound Currency for a Disorderly World?

By JESSE W. TAPP
Vice-President
Bank of America

THOSE of us interested in "sound" money are concerned over the fact that most people take money for granted if they have it or expect a grant, a subsidy or a non-recourse loan when they are short of it. We have a highly efficient money system which encourages most people to ignore the

The Foreign Aid Program and Its Relation to the Mining Industry

By R. L. WILCOX
Chief, Nonferrous Metals Branch
Economic Cooperation Administration

WHERE do we stand today after two and one-half years of the Marshall Plan undertaking? The rate of industrial production averaged 24 per cent above prewar levels for the countries involved in the Plan. Europe in 1950-51 will earn about $3,000,000,000 less than it has to pay out and, if aid were stopped now, in less than six months all accomplishments under the Marshall Plan would be undone. The U. S. needs a high level of exports to give other countries an opportunity to adjust production and trade that will enable them to become self supporting members of the world economy. The sensible thing is to build up the production of other countries so that they can earn the dollars needed for their recovery.

In regard to the U. S. mining and mining equipment industries, the ECA has been assisting these industries in maintaining a high level of exports by creating the opportunity of financing participating countries' purchases through making convertibility of European currencies possible. From April 3, 1948 to June 30, 1950, the ECA has issued Procurement Authorizations for the purchase

of nonferrous metals, ores, and concentrates, coal, nonmetallic minerals, mining machinery and equipment in the amount of $1,238,500,000 of which $592,300,000 was authorized for procurement from the U. S.

ECA furnishes assistance to participating countries for exploration and development of strategic or deficiency material resources through loans for delivery to the U. S. stockpile. The European countries will remain net importers of nonferrous materials. The U. S. and other countries of this hemisphere need have no fear of a flood of metals and minerals from ECA countries that will act to the detriment of domestic mining. The anticipated purchase of nonferrous materials by the ECA countries is expected to be not less than $310,000,000 in 1952-53.

The Future of Gold

By HONORABLE HARRY P. CAIN
U. S. Senator from Washington

THIS article appears in full beginning on page 22 of this issue.

MINE OPERATING PROBLEMS

Session Chairman

WESLEY P. GOSS
Vice-president and General Manager
Magma Copper Co.

Progress in Mechanization of Timber Handling at Butte

By T. S. VEAZEY, Jr.
Assistant Research Engineer
Anaconda Copper Mining Co.

MECHANIZED timber handling at Butte is still in the stage of development. Much experimental work and numerous time studies have shown that handling of the 250 railroad carloads per month of timber and its distribution to nine principal operating mines is greatly facilitated through the use of fork lift trucks.

For many years timber handling from railroad cars, through framing mill to working place, was done manually, a piece at a time. Throughout the entire program of experimental work and development of mechanized handling methods the aim has been to devise a single package of timber which could be handled as a unit from the point of shipment to the working place.

Plans were made to mechanize immediately as much of the handling of dimension timber as circumstances would permit. For this purpose two 7½-ton lift trucks were purchased. These have speeded up the transfer of material from railroad siding to mines by motor truck by four to one compared with the handling rate when all work was done manually. Where limited space formerly required hand piling of material, lift trucks showed a six to one advantage in speed even though the distance from railroad to stockpile exceeded a hundred yards.

A cage deck size unit is 26 in. thick and 38 in. wide. Experimental attempts to load these units onto cage decks for transportation into the mine showed that the grab-jaw lift truck was impractical. A "walkie" type fork truck was designed for loading bundles or pallets onto the cage decks in upright position.

At Butte the present status of the mechanization program is as follows: (1) large lift trucks are handling lagging and dimension timber for five principal operating mines; (2) a central handling yard is about to be constructed; (3) a two-ton grab-jaw truck is being used successfully for loading steel strapped unit packages of lagging into crates; (4) a portable, fork-lift truck has been developed, compact enough to be transported on the cages and still strong enough to unload bundles from the cage decks at underground stations; (5) the method of loading cages on the surface is still in the experimental stage; and (6) the practicability and costs of changing from round to slabbed or squared mine timber, adaptable to unit load packaging, is now being investigated.

Diesel Haulage at The Ruth Open-Pit

By PAUL HETT
General Superintendent of Mines
Kennecott Copper Corp.

THIS article will be published in full in the November issue of MINING CONGRESS JOURNAL.

Incentive Wage System Increases Labor Efficiency

By JOHN G. HALL
General Superintendent
Chief Consolidated Mining Co.

PRIMARY reason for wage incentives is to get lower unit costs and to improve earnings of employes. Essentials of a good incentive system are that it should be just to employer and employe; it should have a high standardized task and a generous reward for effort; it should be unrestricted as to the amount of earnings; it should be simple for the employe to figure his bonus; it should be flexible and intimately related to other management controls; it should have the support of management and employes; it should not be used as a temporary expedient; and, last, its standards should not be changed unless the economics of the operation change importantly.

Incentive plans may be used to apply to individuals or to cover groups. Small group plans have several advantages which are that they develop a spirit of cooperation and teamwork; include skilled workers to aid slow beginners

and backward employes, save clerical help, promote alertness in group work, and simplify cost determinations.

These principles are the basis of the Chief Consolidated mine incentive system covering 95 percent of the working force. Fifty-one separate plans are in effect and cover all stope development, shaft sinking, shaft repair, haulage, hoisting, caging, diamond drilling and other special operations. Contract calculations are based on production records or on engineers' measurements. Stope contracts cover 100 percent of the stoping operations. Calculations of earnings are simple and footage contracts cover all drifting, raising, and sinking operations.

This incentive system has functioned to increase tons mined per man-shift, to increase footage per man-shift, has lowered unit costs and has increased employe earnings.

STRATEGIC METALS STOCKPILING—TARIFFS

Session Chairman

J. B. HAFFNER
General Manager
Bunker Hill & Sullivan Mining & Concentrating Co.

Hydraulic Hoisting

By PERCY S. GARDNER, JR.
Bagdad Mining Co.

MOVING solid materials from underground to the surface in a continuous stream is a notable development of mining. The hydraulic hoist is a device which will lift a continuous stream of ore through a vertical column of water without interrupting hoisting for mine service and removal of waste. It consists of two pipes joined together at the bottom, a motor driven pump at the top of one column circulating water downward in that column, a set of loading chambers at the bottom of the "upward" column for the purpose of introducing ore into that column, a displacement pump at the chambers for the purpose of displacing a volume of water from the upper to the lower chamber equal to the volume of ore charged into the upper chamber, a pressure equalizing valve at the chambers to equalize pressure in the upper chamber with that in the lower chamber, a dewaterizer at the top of the upward column for the purpose of dewatering the ore and allowing the water to return to the pump for recirculation.

Being in static balance the two columns require little power to keep them in motion. The upward flowing column contains sufficient inherent energy to lift any ore introduced into the column and discharge it at the top.

Conclusions listed are based on model operation. Ore should be crushed to at least one-third pipe diameter and the velocity to lift ore will be the same for all sizes of pipe. Capacity will vary with pipe size. Power determination is based on a formula resulting from experiments with a model. Loading cycles will be from 30 seconds to one minute and dewatering will be done by a Robbins dewaterizer. Material will not be classified in hoisting pipe and no bridging over or hangups will occur in the charging valves or pipe entry from lower chambers. Large pieces will offer no difficulty so long as they are smaller than the pipe diameter. Tramp iron will pass readily up the pipe with the ore. Ore load in the column does not increase static pressure and when the system is applied to an inclined shaft power requirements are about doubled and wear on the pipe becomes increasingly important. Loading chambers may be installed at different levels in the same column and, within limitations, charged at the same time. The depth from which ore can be raised is limited only by the strength of materials. A depth of 5000 ft at a pressure of 2150 psi seems well within the limits of modern design.

Domestic Supplies of Strategic Minerals

By DAVID D. BAKER
Consulting Engineer
Reno, Nevada

DURING a war emergency we need an abundant supply of the metals needed by peacetime industry and in quantities so that industry may operate at peak capacity and expand to meet military needs. Prior to World War II, steps were taken to revive production of many strategic metals. No such activity is being conducted at present and it appears that activities have been directed more toward the discouragement of individual initiative. It is high time that everyone take stock of our position with respect to these vital materials.

Manganese during World War II reached a production high of 250,000 tons in one year; at the same time the steel industry required about 1,300,000 tons. Domestic production of high grade manganese cannot possibly be expanded to take care of yearly needs. However, domestic reserves of low grade manganese could be brought into use and could supply the steel industry for perhaps a hundred years. Right now we are desperately short of domestic manganese and there is much to do before low grade reserves can be made usable.

Chromium production from 1940-1945 amounted to 297,000 tons; during this period more than 850,000 tons annually were required by steel and chemical industries. Millions of dollars spent on developing the Mouat and Benbow chromium properties in Montana have gone for naught as the plants have been completely dismantled and the equipment sold. If the necessary treatment plants were set up and required modifications made in steel manufacturing technique, the domestic supply of chromium could supply requirements for six years at the present rate of consumption.

Vanadium, produced in recent years as a by-product of uranium mining, has been available for stockpiling. Large low grade reserves exist.

Molybdenum exists in abundant supply.

Tungsten mining in the United States is subject to competition with foreign sources and a year ago most domestic operations were at the point of shutting down. A great part of our country's emergency requirements could be filled if the selling price were brought into line with present-day production costs and if the onerous specifications—particularly with respect to molybdenum—were to be liberalized.

Cobalt production in the United States has come primarily as a by-product from magnetite mined at Cornwall, Pa. Some is recovered in the electrolytic zinc plant of the

Sullivan Mining Co. Calera Mining Co. is now engaged in development of a deposit and construction of a refinery that aims at producing 2,000,000 lb annually.

Nickel production from domestic sources is insignificant. However, the Sudbury district of Canada holds the largest known reserves of nickel. Eighty percent of domestic requirements of antimony have come from abroad. The largest domestic antimony reserve is in the Yellow Pine property of the Bradley Mining Co.

Quicksilver mining in the United States is at low ebb. From a peak of 5000 flasks per month, production has dwindled to about 50 flasks. It is estimated that a price of $300 per flask will be required to bring the domestic output back to peak wartime production.

Titanium from domestic sources has shown great improvement as the result of the development of the Sanford Lake deposit by National Lead Co. In Canada, extensive reserves are being developed at Allard Lake by Kennecott Copper Corp. and the New Jersey Zinc Co.

Domestic sources of tin, strategic mica, quartz crystal, asbestos, and certain other minerals are practically nonexistent. Although we are not a "have-not" nation with respect to most of the minerals needed to sustain our peacetime economy, we cannot claim self-sufficiency in many minerals vital during a military emergency.

Progress in Stockpiling for National Security

By CARL ROLLE, Stockpiling Advisor, Munitions Board

(Presented by Col. Earl Payne, Munitions Board)

THE Munitions Board has no intention of slowing down its stockpiling program, nor of releasing materials to relieve the combined pressure of military and civilian demands upon available supplies.

Stockpiling objectives have not been affected by the Korean war but have been determined and revised from time to time after weighing four basic factors: (1) the probable duration of an all-out war; (2) the annual requirements for direct military, war-supporting and essential civilian uses; (3) the probable world sources to which the U. S. would have access during war; and (4) the annual quantities the U. S. could produce at home or import from the accessible sources.

The relation of the stockpile purchasing program to the mining industry must be considered from a long-range viewpoint. The primary consideration has never been the impact on the mining industry but rather the contribution to the national security of the country. While the Munitions Board has repeatedly declared its belief that a strong, productive and efficient mining industry is basic to national security, it is not the purpose of the stockpile program to support that industry.

Board estimates indicate that domestic mines can supply 75 percent of the total copper requirements of an all-out war, and that an additional 20 percent is reasonably assured from abroad, leaving 5 percent to be stockpiled for security. Lead is in a somewhat similar situation, except that domestic production will be slightly smaller and imports somewhat larger. As to zinc, only about 50 percent can be counted on from U. S. mines, 30 percent from imports, leaving a deficit of about 20 percent to be stockpiled.

By contrast, the stockpile quota for tin must be set at 75 percent of war needs, and 65 percent for manganese.

Total value of the stockpile now exceeds $1.5 billion as compared to a total need of about $4 billion. Enough materials are on order to bring the stockpile to the halfway mark.

As operations are scheduled, a blueprint for emergency including changes in operations to yield largest production per man-hour of basic material, plus such by-products as beryllium, columbium, cobalt, tantalum and cadmium, should be developed.

Congress Reviews the Stockpile Program

By HONORABLE CARL T. DURHAM

Member of Congress from North Carolina

URGENCIES of the times demand strong measures such as: (1) obtaining and stockpiling all the tin, nickel, diamonds, rubber, sisal, abaca and other items we need from abroad to keep our industry going in time of war; (2) studying constantly the health and problems, the capacity and reserves of our domestic mineral industry, and whenever the opportunity arises adding to the stockpile at reasonable cost, at the same time preserving any marginal mine whose output would be necessary in wartime; (3) raising the "artificial 25 percent differential of the Buy American Act"; and (4) entering into long-term contracts with domestic producers of seriously deficient materials.

Unless this program is followed the United States may be in the position of being completely dependent upon foreign sources for our manganese—rather than *independent* of foreign sources. The policy of buying cheaper from outside the United States may turn out to be a most expensive mistake.

The mining industry is as important to the national defense program as any industry in the United States. It has and will play its part in any emergency. The mining industry should be treated as a weapon of defense—and not an unessential avocation that can be left to wither on the vine—trusting that it can be resuscitated in time of war.

Tariff Needs of the Mining Industry

By PAUL B. JESSUP
Vice-President
Day Mines, Inc.

WHETHER tariffs should be applied or not is a question arising out of a conflict between the economic law of supply and demand and the natural law of self-preservation, and which should take precedence in a given situation. Individually we are free traders or protectionists as selfish interests dictate. Manufacturers will fight against the imposition of tariffs on raw materials and fight equally as hard for the retention of tariffs on finished products. Economists make good theoretical arguments for free

trade, but make exceptions whenever national interest is involved. When a conflict arises on the national level, the law of self-preservation should take precedence over the law of supply and demand.

National welfare demands a protectionist attitude toward our metal mining industry. Our only assured source of supply in wartime is from the national stockpile and domestic production. Although free trade flourishes successfully between the United States because the Federal Government requires it, we would be naive to believe that international free trade could ever exist without international government to enforce it.

Alternatives to tariff protection are imposition of import quotas and governmental subsidization. A premium price plan has some merit as an emergency wartime measure, but should not be adopted as a peacetime practice, as it would ultimately lead to governmental control or ownership, either of which would constitute socialization. Tariff protection offers the advantages of simplicity of administration and equal protection to all. Other action of a protectionist nature could be taken, such as the removal of numerous restrictive policies applied to mining, including those of income tax laws, pubilc land laws, and the Securities Act.

A bill to suspend the copper tariff has failed to pass Congress. Zinc has not to date been adversely affected by the low tariff. Lead mining has been most adversely affected by the low tariff on this metal.

Tariff protection is the fairest and simplest protective device. Tariff protection on base metals has shrunk to a point where it no longer affords adequate protection. Metal mining is so important that it must be given whatever protection is required to maintain it in a healthy productive state. If protection is not given to explore for and develop new orebodies to replace those depleted, incentive will be lost.

State Department policy with respect to base metals must be changed as it is deleterious to long-range national interest. Carried to its logical conclusion, it will weaken our ability to contend with foreign aggression. Congress and the Administration must be made to realize the urgency of the situation and be persuaded to take action to provide the necessary remedies.

MILLING METHODS AND EQUIPMENT

Session Chairman

E. H. CRABTREE, JR.
General Milling Director
Eagle Picher Mining & Smelting Co.

Operating Factors and Recent Developments in Heavy-Media Process

By L. J. ERCK
Chief Metallurgist
The Cleveland-Cliffs Iron Co.

GREAT progress has been made since 1936 when Heavy-Media separation was tested at the Mines Experiment Station of the University of Minnesota with a 6-in. cone. In the intervening years many hours of toil, concern and thought have gone into the final designs that are now being used. A great variety of equipment and media were developed for use in the process. Recovery of ferrosilicon and magnetite media was greatly improved by the use of magnetic separators. Likewise the densifier has undergone consistent developments for simplifying and increasing the efficiency of the Heavy-Media process.

For some time it was thought that the lower practical limit of screen sizing treated by Heavy-Media was around ⅛-in. Experimental work has steadily reduced the size of feed and it now appears that ways and means will be developed for separating at least a portion of the ore down to 100 mesh to further extend the field of application of Heavy-Media. The possibility of a three-way separation has long been desirable, particularly in one vessel. Various factors do not make it practical to accomplish this simultaneously in the same vessel but the challenge has been taken up in several quarters with varying degrees of success. One company, to produce three products, successfully uses two drums operating in tandem.

Basically, Heavy-Media flowsheets have not varied greatly. A Heavy-Media separator followed by adequate screening and recovery equipment for maintaining a low degree of media loss as well as retaining a fluid media for efficient separations is still basic.

Factors controlling Heavy-Media costs include geographic location, type of media, amenability of ore to the Heavy-Media process, ratio of concentration, general economics and whether or not the process is to be used for final concentration or as a scalping process for primary elimination of tailing material. Factors contributing to success are concentration of ores in which the specific gravities of ore and gangue are too close for hydraulic separation. Heavy-Media separation produces higher recoveries due to closer selectivity based on apparent specific gravity. The process makes it possible to handle larger tonnages; and the rapidity of separation means more tons of concentrates per man-hour worked.

Diamond Recovery by Heavy-Media

By IAN F. CAIRNS
Assistant to Manager
Fraser & Chalmers (S. A.), Ltd.
Johannesburg, South Africa

HEAVY-MEDIA in South Africa started with the decision of the DeBeers Corp. to reopen the Premier Diamond Mine at Cullinan, Transvaal, in 1945. Work started with a 20-in. standard Heavy-Media cone unit to conduct experimental work. This was unusual test work as none of the products could be assayed. Tests are carried out and the products are passed over grease tables or in certain cases the products must be hand sorted. Also the ultimate concentrate of the diamonds is anything between 1 in 12 to 1 in 20,000,000 parts.

When the test work proved encouraging, the Heavy Media plant was installed to handle 80-100 tons per hour. An initial separation was conducted at 2.9 sp gr. The blue ground itself has 2.7 sp gr and in diamond workings around 3.5. When blue ground is crushed it cleaves along lines of diamonds so that ten-mesh sizes will be exposed in crushing to ⅜-in. After certain modifications, pilot plant results were excellent and Heavy Media recovery exceeded that obtainable from jigs.

After nine months of operation, Anglo-Americans placed an order for a 13,000 ton per day plant made up of four

units, again open cones, 16 ft in diam and with 8-in. outside airlifters. The plant was begun in July 1949, completed and in operation by May 1950.

This month another Anglo-American plant is going into operation at Williamson Diamonds, Tanganyika Territory. At Kimberly a small 5-ft pilot plant unit has been operating for about eight months and the company has decided to change over their old jig concentration. A Heavy-Media separation plant has been installed to treat andalusite; a ferrosilicon medium is used with excellent results.

Rod Mill Liners

By J. R. CLARKSON
Mill Superintendent
Bradley Mining Co.

ROD mill liners at the White Pine mine have developed from the first set that ground only 80,000 tons at a prohibitive cost to the present liners that grind up to a half million tons within economic limits. Operating capacity of the 9 ft-6 in. diam by 12 ft-0 in. long mill is 100 tons per hour. Pulp density averages 75 percent solids, rod consumption is 1.28 lb per dry ton, and power consumption is 4.10 kwhr per dry ton milled.

First liners were of wave design, using 60 waves in the shell circle. The waves wore out completely in less than 100,000 tons with consequent decline in capacity due to slippage of the load. A change was made to 40 waves in the circle with slightly improved results. When the second set wore cylindrical, 1½-in. mild steel bars were bolted in, forming 20 rows of lifters which resulted in a much higher tonnage going through the mill. An integrally cast set of bars was used with favorable results though grinding capacity declined as the bar projection evolved into an elongated mild wave effect. The final installation is expected to handle 1,000,000 tons of ore using three sets of bar caps at an over-all cost of 1.45c per ton. A year and a half of operation can be expected without removal of rod charge for complete liner replacements. The first set of end liners lasted 1,300,000 tons, the last set 1,100,000 tons to date.

Rod Mill Liners at Homestake

By C. R. SCHMIDT
Mill Foreman
Homestake Mining Co.

ROD mills used are seven 5 by 10-ft double-trunnion mills and three 6 by 12-ft low pulp level mills. Rods are 3 in. diam with daily makeup. Mill speeds are 18 rpm for the 6 ft diam and 23.5 rpm for the 5-ft mill, making peripheral speeds 332 and 338 rpm.

Chill-cast white iron wave-type liners were used for several years in the 5 by 10-ft mills. Austenitic manganese steel liners were used for several years in the larger mills. In 1939 the first Lorain rolled plate liner was installed in a 5 by 10-ft. mill. Plates were 1½-in. thick with ½-in. corner pads against the shell; there were seven rows of plates with light lifter bars. Results were fairly good but the small pads worked loose, allowing plates to shift. Next 2-in. plates were used without pads and light lifter bars; two sets of bars were worn out during the life of a set of plates. Recently the plate thickness was increased to 2½ in. with heavier bars; only one liner has been worn out so far, but three others still in use have made an excellent record.

Mose recently, 2½-in. plates recessed to take heavy lifter bars that are heat treated are in use. The present appearance of the lining seems to indicate that the bars will outlast the life of a set of plates.

In the 6 by 12-ft mills only two sets of 2½-in. Lorain liners have been worn out. Three sets of heavy bars have been used per set of plates. One set now in use has milled over 450,000 tons and should do 475,000 for 9.3 tons per lb of steel.

Current practice includes lining mill shells with extra heavy composition roofing to compensate for shell wear, especially near the discharge end. Rubber chute lining is used under the lifter bars and under plate joints to prevent accumulation of amalgam behind liners.

Recently the first Lorain rolled head liners were installed.

Rod Mill Liners at Anaconda

By C. F. MILKWICK
Assistant Superintendent of Concentration
Anaconda Reduction Works

TO handle ores at the Greater Butte project it was recognized that the Anaconda concentrator would have to be remodeled to treat 15,000 tons per day. In the study of the various flow sheets, rod mill liners were examined as a fine crusher. A 9 by 12-ft rod mill was installed in December 1946 with the feed and discharge ends lined with manganese plates. Feed end liners gave a campaign of 1,625,000 tons and the discharge end gave 1,800,000 tons. Shell liners were of the three-wave type made of manganese steel; at the end of 100,000 tons the mill was smooth as a rifle bore.

A liner was designed that didn't play out until 348,000 tons had been crushed. For years the standard liner for ball mills was of the Forbes type and made of ordinary cast iron with a small amount of chrome; then a solid liner was designed of NiHard containing roughly 1½ percent chrome and 4½ percent nickel with a Brinell of about 600. With this as the clue, rod mill liners were cast with the lifter and shell plate integral.

A set of alloy steel liners of the same design was tried out made of heat treated Utaloy and gave a campaign of 404,500 tons.

The combination set of NiHard plates was used for the first three courses and Utaloy plates for the fourth course, next to the discharge end. The solid lifter and plate was discarded in favor of detachable lifters made of Utaloy. This set went into production in July 1949 and is still in service having crushed 359,000 tons.

Sets of different design and material were tried in the second mill. This set, designated as the Lorain type, consists of plates and detachable lifter bars. Present plans contemplate the lining of the next five mills with NiHard liners made at the repair foundry.

As a part of the modernization program three mills were installed at the zinc concentrator to treat approximately

4000 tons per day. Although a three-inch rod has been sufficient for breaking the copper ores, it will be necessary to go to a heavier rod in zinc service. For these mills we plan to follow the design used at Yellow Pine and install a set of plates and detachable lifters made of alloy steel.

Rod Mill Liners

By ROLLIN A. PALLANCH
Mill Superintendent
U. S. Smelting Refining & Mining Co.

ROD mill and ball mill practices are closely associated at Midvale. Each unit of the mill is made up of a 5 by 10 rod mill, a 54-in. classifier returning over size, a 5 by 10 ball mill, and a second 54-in. classifier returning over size. After 24 years no basic change has occurred in the design of the rod and ball mill liners. Recent studies have been made of the Howe double-step design, the Lorain rolled plate design, and the two piece Anaconda type. Attention has been concentrated on improved materials and better bolt design.

Square-head bolts were used in 1926 and 1927 with white cast iron, chrome steel, and manganese steel liners with unsatisfactory results as only about 67,000 tons were milled. Wedge-head bolts were employed at different dates from 1927 to 1938 and 1939 with manganese steel and chrome molybdenum steel liners but were discarded after milling tonnages ranging from approximately 73,000 to 120,000 tons. Improved wedge-head bolts were used from 1940 to 1948 when up to nearly 141,000 tons was run through a single unit and the quantity of 142,000 tons was milled in units equipped with "oval" wedge-head bolts and chrome molybdenum steel liners.

Two sets of shell liners are worn out for each set of end liners. Over a six-year period no benefit was observed in operating one unit at 22.5 rpm or about 10 percent faster than the other three units. No advantage was noticeable from the standpoint of either power or liner wear.

A quick increase in capacity was dictated by the war. As motors were underloaded, the company turned to Lorrain plate and bar liners. With the end of hostilities and opportunity to procure alloy steels, attention turned to chilled Ni-Hard and Utaloy.

Studies up to this point confirmed what was required of rod mill liners, three important factors being:

(1) Complete protection of the shell
(2) Freedom from time lost due to leaking liner bolts
(3) Transmittal of power from the shell to the rod mass with a minimum of slippage.

Early it became obvious that application of these three factors varied greatly for large and small diameter mills. A major factor in liner design is the effect of rod mill speed. Experience indicates that liners can be worn much thinner. Twenty-six years ago the company started out with a wave liner and today has changed to an inverted wave. As backing material wood, rubber, and zinc have been tried and, on fast running small mills, liners backed with zinc have proved to be the only means of stopping leaking bolt trouble and of completely wearing out liners.

Cost of zincing in liners on a 6 by 12 rod mill on 1949 tests were:

Labor	$221.00
Loss of 910 lb of zinc at 15c/lb	136.50
	$357.50

More massive liners in the 9-ft mills at Bradley and Anaconda apparently are successful but corrosion by Tennessee's heavy sulphides ore shortens liner life.

Rod Mill Liners

By J. F. MYERS
Mill Superintendent
Tennessee Copper Co.

AFTER 26 years of operating rod mills, the company is still experimenting with liner material and design for the 6 by 12 rod mills used on the property. Various types of liners have been employed over the years. These include cast wave types with waves varying from ½ in. to 4 in., single and double row. Shiplap type liners were used next, experiments being run with and against the lap, employing different kinds of metal.

Mill Liners at Sullivan Concentrator

By H. R. BANKS
Mill Superintendent
Consolidated Mining and Smelting Co. of Canada Ltd.

AFTER the experimental rod mills at the Sullivan concentrator, Chapman Camp, B. C., had crushed 2,400,000 tons, the normal charge was 8600 tons and the mill was run at a normal speed of 17.3 rpm with an indicated optimum feed density of 85 percent solids, there was only very slight wear on liners and lifter bars. Rods with diameters up to 4½ in. were used and rod wear was under 0.25 lb per ton of mill feed. It is felt that rods should not be permitted to slip against the shell because most of the work of the mill is done by the lifter bar driving the upmoving mass of rods firmly against the down-coming. The energy of this action is transmitted through the various strata of rods with their interspersed feed. If this action can be maintained positively through a range of speed, the ultimate work done will increase directly with the speed—at least to a point above 80 percent of critical.

Another point in favor of positive lifters is the avoidance of slippage of rod mass. Where 90 tons of rod are used, it is not difficult to visualize that wear on lifter and liners would be extremely great if the rod mass were to stand still and the mill rotate about it. As more is learned about this equipment it is hoped to add something to the art of comminution. A machine which combines both the crushing and screening functions permits the preparation of feed for the next step in comminution, ball mill grinding. The minimizing of accidental oversize allows the use of a ball charge of optimum size.

Application and Performance of the Dual-Impact Breaker

By ANGUS C. ENSIGN
The Gallgher Co.

DOUBLE impeller breakers have been in use for over ten years and today 130 of them are in operation. While the machine does not fit 100 percent of the crushing jobs it can handle 80-85 percent affording greater capacities and better end products without excessive horsepower.

The machine is manufactured in four sizes, the largest capable of handling pieces up to 50-in. in cross-section and which will produce as much as 400 tph minus 4-in. material. Double impellers rotate in opposite directions at speeds of 250 to 1000 rpm. Each impeller weighs more than two tons and three striking bars weighing 400 lb each are provided for each impeller. The statically balanced impellers have a fly wheel effect when set in motion so that less horsepower is required per ton of material produced with lower operating costs for most materials reduced. All material is broken by impact while in suspension, the impeller bars driving broken material against breaker bars and other stone for further reduction. Product size adjustments are simple as the greater the speed the finer the resulting material. Numerous installations actively operating indicate the adaptability of the machine.

Golden Cycle's Modern Mill

By MAX W. BOWEN
Vice-President & General Manager
Golden Cycle Corp.

THIS article will be published in full in the November issue of MINING CONGRESS JOURNAL.

SAFETY—LABOR RELATIONS

Session Chairman

HOWARD I. YOUNG
President
American Zinc, Lead & Smelting Co.

Safety Progress in Metal Mining

By DAN H. HARRINGTON
Former Chief, Health & Safety Branch
U. S. Bureau of Mines

SINCE 1913 the over-all accident fatality rate for the United States has been reduced 28.4 percent, whereas in essentially the same period non-coal mines have reduced their fatal accident rate 63.6 percent and coal mines 74.6 percent. Continuation of this notable progress in accident prevention on the part of the mining industry will bring fatal accident occurrence to the irreducible minimum within the present decade. Since 1931 metal mining has been doing its full part in this progress and has reduced its fatal accident rate by 52 percent more than any other segment of the mining industry. Based on careful analysis of the data on mine injuries, the minimum fatal injury rate that can be expected by the mining industry should be achieved by 1960. This minimum rate should be about 0.25 fatal accidents per million man-hours.

Education rather than compulsion is the key to bringing accident occurrence and ill-health in the mining and allied industries to a reasonable minimum.

In May 1949 the President of the United States recommended to the President's Conference on Industrial Safety that the primary political subdivision in governmental operations in the field of accident prevention should be the state. Municipalities should not be granted partial regulatory or enforcement authority in the field of industrial accident prevention. The Federal Government should confine itself to nation-wide statistical activities for comparative purposes; to fact-finding activities to provide technical information for use by governmental agencies or by private organizations in the building of codes and practices; to studies of administrative procedures to assist state agencies in improving their techniques; to give advice to state agencies concerning the enactment of appropriate legislation.

D. H. Harrington

In general the larger and more responsible mining organizations are now doing a good job in prevention of accidents and ill health. They must also help in the education of those recalcitrants, a minority in the various segments of the mining industry, who have not been doing a decent job towards providing reasonably safe and healthful surroundings and working conditions for their employes. Unless such conditions are provided the parlor pinks and vote-seeking politicians are likely to bring about the nationalization of the mining industry in the United States.

The Future of Our Labor Laws

By HON. GRAHAM A. BARDEN
Member of Congress from North Carolina

THE only approach to thinking of future labor laws is through amendments to the Taft-Hartley Act and the Railroad Labor Act. The Taft-Hartley Act is now the basic law of this land and will remain on the statute books.

That Act protects the workers as they have never been protected before from those who would invade their proper rights. It protects industry. It protects a group that is so often forgotten when legislation is being written at the instance of one minority group or another. It protects the American people and the American way of life, definitely its most important feature.

It has been under attack and the Taft-Hartley repeal act will be one of the No. 1 bills when Congress meets again.

American economy in the last few years has undergone many changes. Industry has developed and can now outproduce the world. Along with this growth and the power

that naturally follows, the wealth and the power of industry, it was necessary that Congress enact the Anti-Trust Law to prevent combines from getting into operation that could stifle or interfere with the normal American way of life. Some thought the Anti-Trust Law was going to ruin the works. It hasn't. It has been a little rough at times but it hasn't ruined any society yet.

Labor, too, has developed and as Labor grew Labor became a powerful force in our American economy. Labor came of age by virtue of many Acts passed by Congress encouraging and strengthening the right to organize and the right to bargain and to self-protection.

But the thing that some Labor leaders do not want to recognize is that along with the powerful position go certain responsibilities to society and to the American way of life. And so, there must be rules and regulations to protect the great segment of the people who do not carry union cards or who do not own or operate industry but are all grouped with Labor and Industry, to make our American economy.

People should not be required to stand in mortal fear of a paralyzed economy, as they have at times been forced to do.

"Paralyzed economy" means coal strikes, telephone strikes, railroad strikes, all of which would in a short time put the safety of our country in the hands of a small group of labor leaders, not in the hands of the Army, the Air Corps, and the Marine Corps.

Can nationwide bargaining continue? Is it practical? Is it safe? The present situation presents such real, existing dangers that it is absolutely imperative that a solution be sought to protect the American way of life from the setting up of a situation where a small group of leaders from any walk of life, from any industry or from labor, could paralyze our American way of life; paralyze our economy and make us helpless in the face of an enemy.

The present happenings, the present events, are such that Labor can be given the same consideration that can be given to any other great prop under the American way of life. Certainly Labor makes a great contribution. Nobody would want to be unfair to a man who works for his living—and who doesn't work for his living?

Let Labor be mindful of the other segments of society. They, too, contain families; they, too, are a part of this society; they, too, are entitled to the very best things and ought to be safeguarded. This can't be done if legislation is to be for the sole benefit of an organized minority, whether it be industry groups, or the Legion, or Labor, or anyone else.

Responsibility for production is shared by labor, management and the public

Labor Relations Today

A Symposium by

A. C. THORNTON

ROY H. GLOVER

ROY HATCH

A. C. THORNTON

Industrial Relations Manager

International Minerals & Chemical Corp.

THE seventy-three day work stoppage at Carlsbad would have resulted in a greater shortage of potash for American agriculture, more loss of income and hardship on the local community and employes alike, a greater burden on management, and the strong probability of physical harm and violence to local citizens, if the Taft-Hartley Law had not been invoked to end the strike.

The law as applied to this strike set up rules of conduct for the public interest and protection and in no way restrained either party in the exercise of free collective bargaining. It in no way interfered with the union's intent or purpose to use the strike as an economic weapon to seek gains and did not prevent a strike or even delay one. There was complete freedom under the law in this regard, as the Act specifically protects the rights of employes and unions to strike.

The present labor statute operated to the public interest as applied to the conduct of the work stoppage, but did not interfere with free labor and free management in free collective bargaining.

We all agree that strikes are costly and some are not necessary. Appropriate new legislation designed not to eliminate economic pressure upon the employer, as such, but to condemn such pressure from being applied to the public and the Government as a matter of policy and procedure, is seen as a step forward toward wholesome industrial peace.

The best laws our Congress could devise would not eliminate strikes completely, nor adequately increase worker efficiency. Something more is necessary, some of which industry can supply and improve. Companies within industry can set up their organizations for more efficient production through greater use of human energy. They can procure good human resources and train supervisors in leadership-skills, and understanding of the company's policies and contributions to the American economy. They can develop and apply effective methods of basic communication, which go beyond the value of imparting information and facts, and which recognize the feelings and purposes of people as well. All of this takes time and investment but has a direct and wholesome effect toward increasing worker production.

American business, by and large, has invested, reinvested, worked hard at building up our national wealth and productiveness. American business has the resourcefulness, the energy, and reasons for continuing to better

our American way of life through better industrial relations.

Organized labor has a similar opportunity and responsibility. The challenge exists for free competitive capitalism in which free American labor has a stake to better its productive record through better use of human energy, and by continuing an American industrial team which recognizes the rights of the individual.

R. H. GLOVER

Western General Counsel

Anaconda Copper Mining Co.

ON the occasion of labor strife in a jurisdictional dispute which threatens to interrupt operations, management has these remedies available to enforce the terms of a collective bargaining agreement: (1) a suit for damages against either the union which is bargaining agent for the employes who may go on strike, or the union causing or inducing a strike, and (2) a petition for injunction to obtain a court order directing the strikers and the union to stop such activities.

Under existing laws, unless the right to strike is expressly reserved, the employes cannot go out on a strike during the life of the contract without breaching it. This fact does not seem to be generally understood by many unions or even employes. It is often believed erroneously that the absence of a no-strike provision connotes the right to strike at any time.

It is common knowledge that the CIO has expelled a number of international labor unions from its organization. Included among the outcasts is the International Union of Mine, Mill and Smelter Workers, which, for many years, has acted as the collective bargaining agent for most of the production employes in the nonferrous mining industry. Immediately following the expulsion of the Mine-Mill Union, the CIO allocated to the United Steelworkers jurisdiction over the employes in our industry with the green light to engage in full-flight raiding activities. These raiding programs have taken place in almost every locality where employes have been represented by the Mine-Mill Union. In some operations the steelworkers have been successful in obtaining recognition as the employes' bargaining agent, while in others their organizational campaign has met with resistance and the jurisdictional battle continues. As this friction intensifies, we find the industrial peace which we purchased with the concessions granted in our most recent collective bargaining agreement seriously threatened. Just what action each of the unions may adopt in its efforts to prevail is impossible to anticipate, but we do know, from the history of jurisdictional strife in the labor movement, that resort to strikes, as well as violence, is a not uncommon method utilized to force recognition, or, having secured recognition, to obtain fulfillment of the promises made during the organizational drive. Our defense to such action necessitates an understanding of the protection afforded by the law during the term of an existing collective bargaining agreement. This protection is more extensive than realized.

In appraising the industry's security under an existing collective bargaining agreement a thorough understanding of the means of insuring industrial peace during the lifetime of the agreement should be had. The 80th Congress, through the enactment of Section 301 of the Labor-Management Relations Act, provided that any labor organization representing employes in an industry affecting commerce may sue or be sued as an entity and in behalf of the employes whom it represents; and amended the National Labor Relations Act so as to include the requirement that the employer and the union continue in full force and effect without resorting to strike or lockout all the terms and conditions of the existing contract for a period of 60 days after notice of termination or request for modification is given, or until the expiration date of the contract, whichever occurs later.

ROY HATCH

Assistant to General Manager

Kennecott Copper Corp.

MANY members of the nonferrous metal industry are bargaining for the first time with unions whose economic experience has been limited to those industries where expanded labor costs can be passed directly to a consuming public. The imposition of this same philosophy upon an industry whose prices are based on international markets may easily result in decreased activity in the domestic nonferrous metal mining and its allied industries through their inability to compete with foreign wages and living standards. Therein lies a threat to our national welfare and security which must be recognized by both employer and employe in granting or seeking expanded fringe issues.

The trend of bargaining indicates that those contract provisions acceptable by industries in the East are eventually adopted in our Western States. This means we may reasonably expect enlarged social benefit costs. These will arise from pension programs, sick leave, expanded medical plans and other employe welfare matters that may have been adopted. These, alone, may add as much as 8c per hour to wage costs.

There will be continual pressure for increase in direct wages in amounts at least equal to those accepted by major industries as periodic increases during long term contracts.

Often overlooked in considering a labor contract are the hidden costs imposed upon management by legislation, contract provisions or humanitarian aims.

Assuming the average wage rate of employes in the western nonferrous industry is $12 per day, this labor cost is increased by social and wage benefits through statutory requirements or contract phraseology by approximately 23 percent. These costs, in addition to the published contract wage, total 35.2c per manhour or $2.81 per eight-hour shift and include such items as statutory overtime, daily overtime, shift differential, vacations, holidays, social security, unemployment and workmen's compensation, medical, hospitalization and insurance, and employes housing, eating and recreational facilities.

Direct wages, indirect wages, and company contributions for employes' benefit are paid on the basis of employes' time in service and not time worked. The eight hours of service, in many instances, include time required to transport the employe from the surface to his working place and return to the surface. Where eight-hour portal-to-portal or rim-to-rim laws are in effect, time spent eating is included.

Thus in many instances, time available for productive effort on the part of the mine workers is materially reduced, where pay is on a portal to portal basis, by the inclusion in the eight hours daily service of traveling and eating time.

EXPLORATION—DEVELOPMENT OF NEW RESERVES

Session Chairman

HAROLD A. KRUEGER
Production Manager
St. Louis Smelting & Refining Div., National Lead Co.

White Pine—A Potential Major Copper Producer

By FRANK A. AYER
Vice-President
Copper Range Co.

LOCATED on the northern peninsula of Michigan, 20 miles southwest of Ontonagon, copper deposits of the White Pine mine occur in shales and sandstones and are folded and faulted in places. Some 15,000 ft of diamond drilling was originally planned to determine the limits of the ore body. Continued drilling has not yet found the limits of the ore. Drill holes are being put down on the corners of 1000-ft squares. More than ten square miles of ore have been drilled to date. A number of copper bearing beds occur and if the "total ore column" was mined, from upper shale to lower sandstone, it would total 15-20 ft averaging 22.3 lb per ton and would include some 5-6 ft "waste" averaging 4 lb per ton. Separate mining of the waste center with subsequent simultaneous mining of the upper and lower ore would result in about 10.5 ft of ore averaging 30-31 lb per ton. Mining of 8 ft of the parting shale plus 2 ft of lower sandstone would result in an average of 24 lb per ton.

Mining operations will take advantage of the exceedingly strong hanging wall of silicified sandstone and be based on 40-ft rooms because of the absolute certainty of mining estimated grades and equalling estimated costs.

The Bill Schacht shaft sunk in 1945 has enabled checking of diamond drill results and conditions that would influence mining methods and costs. Over 6000 ft of contour drifts were driven from this shaft and underground sampling has checked core sample assays consistently. Almost 70,000 tons of ore have been treated in a pilot concentrating plant.

Positive reserves on January 1, 1950, stood at 156,770,000 tons averaging 24.34 lb copper. These are calculated from diamond drill holes at corners of 1000-ft squares. Probable reserves, on the same date, computed with spacings up to 3000 feet when added to positive reserves total 249,610,000 tons averaging 22.3 lb Cu per ton. Drilling in 1949 added some 50,000 tons of new ore to the reserve. Drilling during 1950 continues to develop more reserves and the drilling program continues.

An intensive research program has resulted in development of a concentration method requiring grinding to 100 mesh and producing better than 85 percent recovery in 16 percent concentrates.

Whether to smelt the concentrates or leach them has not yet been decided. Experimentation is in progress on both methods to determine which is the less expensive.

White Pine Mine shows every indication that it will be a major copper producer and a national asset for several decades.

Blackbird Mine Development

By EDWIN B. DOUGLAS
Manager, Blackbird Division
Calera Mining Co.

COMPLETE dependence upon foreign sources for cobalt will come to an end when production begins at the Blackbird Mine. Cobalt has immense strategic value. World production comes primarily (75 percent) from the Belgian Congo and smaller amounts from Canada and Rhodesia.

A 75-ton copper concentrator was constructed on the property in 1938 but operations were suspended shortly before the U. S. Bureau of Mines and the U. S. Geological Survey entered the district searching for strategic metals during the war. In 1943 Howe Sound Co.'s subsidiary, the Calera Mining Co., became active. A 40,000 ft diamond drilling and surface mapping campaign laid the foundation for development of 20,000 ft of underground workings.

Pre-Cambrian sedimentary rocks, principally quartzite and argillite, make up the district's bedrock. Workings have been developed on a northwesterly trending strike length of nearly 7000 ft. No serious complications are anticipated in mining. Weak walls will necessitate close filling which will be provided by deslimed mill tails. Stopes will be brought up either flat backed or the ore will be breasted down in areas where closer filling is needed.

Great difficulties were met in producing a cobalt and a copper concentrate as many flotation tests failed. An expensive method was developed by the Bureau of Mines involving partial roasting. The company metallurgist finally worked out a satisfactory separation by conditioning pulp at a relatively high temperature. Selective cobalt flotation became a reality in 1949.

Location, climate, and transportation make the operation vulnerable. A small saw mill has been erected, a domestic water system installed, diesel powered generators installed, and a tourisite constructed. Steel and frame buildings have been erected.

Copper concentrate will be floated first. Iron sulphides then will be floated and discarded and finally the cobalt separation will be made. Copper and cobalt concentrate will be shipped to Salt Lake City. The cobalt will be treated in a refinery under construction at Oquirrh near Great Salt Lake. Plans call for the production of 2,000,000 pounds of cobalt annually.

Geochemistry, A New Tool for the Prospector

By HERBERT E. HAWKES
Chief, Geochemical Prospecting Section
and
LYMAN HUFF
Geologist
U. S. Geological Survey

GEOCHEMICAL prospecting is defined as the search for chemical halos or "anomalies" in surface materials—rocks, soils, alluvium, vegetation, water—that may point the way to subsurface mineral deposits. Analytical techniques must be delicate enough to detect the presence of an element in any sample; must be speedy enough to have results back in the hands of the sampler before he leaves the area, and

must be economical because of the multiplicity of samples required in a survey. An accuracy of plus or minus 30 percent will usually provide an adequate margin of safety.

Colorimetric techniques have been used in almost all recent geochemical prospecting in the United States and Canada. Rapid methods have been developed for zinc, copper, nickel, cobalt, molybdenum and the heavy-metal group (undifferentiated zinc, copper, lead, nickel, cobalt and some rare metals) in soils and for the heavy-metal group in water and for zinc in vegetation. Test work is now being conducted to develop tests for silver and tungsten in soils and nickel and molybdenum in vegetation and further development work will be undertaken in other metals. Spectrographic methods have been used in Sweden and the Soviet Union with considerable success.

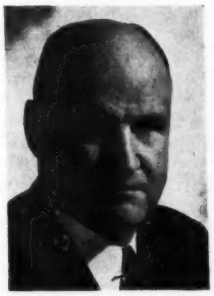
The primary dispersion of metals has been studied extensively but secondary dispersion in residual soils and gossans appears to give the most direct and reliable indication of primary ores and dozens of experimental geochemical surveys have been conducted.

Although no new commercial orebody has yet been found, faulted and pinched extensions of known deposits and sub-commercial mineralized ground have been located by geochemical methods. More than ten independent mining companies in United States and Canada are undertaking experimental or applied geochemical work and the USGS, with a staff of 15 men, is pushing its program.

Geochemical prospecting is in the experimental stage but the methods show promise. Without good geological and chemical guidance or in incompetent or unscrupulous hands, only failures, frustration and disillusionment will result.

Geochemical Prospecting in the Mississippi Valley

By GEORGE M. FOWLER
Consulting Geologist
Joplin, Mo.



THROUGH the years various methods have been employed to try to find new ore bodies. Exploration for ore bodies has been carried on in the Mississippi Valley by drilling on one-fourth to one-half mile centers at a cost of $5000 per square mile. Less costly methods would greatly extend the area that could be economically prospected.

Tri-State ore bodies are confined to small centers of condensed structural deformation within an area of 2000 miles. Soil analysis was first tried in areas already known from drilling and geophysical survey data. When the results of geophysical and geochemical methods were found to check fairly closely, the geochemical method was used in unknown areas.

One small ore body of 50,000 tons was found by this method. It is doubtful that any other ore bodies of minable size will be found in the area tested. Geochemical prospecting was not only usable for eliminating barren areas but also helped to locate faults and shock or shatter at different places over the country.

In the period from 1940 until the end of October 1941 some 11,741 separate samples were taken and analyzed. On the basis of this work it was found that gallium, nickel, cobalt and tin gave the best results. It cost between 75-80¢ per sample at that time; now the cost would be about $1 a sample. The geochemical method costs from $200 to $500 per square mile as compared with $25,000 to $100,000 per square mile when the diamond drill method is used.

Geochemical Prospecting in the Park City District

By RAY E. GILBERT
Chief Geologist
New Park Mining Co.

SINCE June 1949, the New Park Mining Co. has conducted geochemical prospecting on its property in the Park City District. Ore is found principally in veins localized along faults and fractures cutting Paleozoic sedimentary rocks and quartz diorite intrusives. Veins are quartz with sulphides of lead, zinc and some copper. A residual layer of soil 5-30 ft thick covers practically all outcrops. Geochemical work has been confined to a study of the lead, zinc and copper in the soil. First work was conducted over buried vein outcrops and expanded to unexplored areas. Results indicate that heavy metal halos and dispersions can be detected.

Sampling is done on a pre-arranged geometrical pattern. Any area that runs higher than average is resampled with spacing at one-half the original pattern. In known mineralized areas lines 100 ft apart sampled every 50 ft yield a pattern that can be checked by sampling between lines. The humus is removed with a sample pick and 10-20 g of the first soil encountered are taken for a sample. Reconnaissance samples are taken by employing an aerial or topographic map, spacing them by pacing and locating approximate positions. In thick brush control stations are set 1000-2000 ft apart with transit and chain. Plane table and alidade are used in open country, sample lines being run with a Brunton compass.

The colorimetric analytical method is used and a portion of fine soil is selected from the sample for assaying. Standard solutions are prepared, the series corresponding to zinc values of 100 to 800 parts per million. A homemade photometer is used in the determinations.

"Total metal" valves are used in preference to zinc because they tend to emphasize mineralization more than zinc valves alone. Laboratory procedure sacrifices accuracy for speed but accuracy is of an order to produce the desired results.

All data are plotted on 28 by 36-in. sheets on a scale of 1 in. equals 100 ft. A three man crew was found to be most convenient to handle all field, laboratory, and office work involved in soil sampling. The crew did well to take and analyze an average of 45 samples a day. Sampling on a 200-ft checkerboard approximates one sample per acre and preliminary sampling was at the rate of 15 acres per man shift. Sampling on 100 ft lines with samples taken each 50 ft slows the rate down to less than two acres per man-shift.

Geochemical Prospecting at Tennessee Copper

By OWEN KINGMAN
Geologist
Tennessee Copper Co.

RESULTS of geochemical work at the Tennessee Copper Co.'s property have been moderately encouraging. Some geological work was done prior to 1949 but results were not encouraging. Lovering's technique was not considered ideal but geochemistry may be used to help evaluate possible drilling targets.

The ore minerals of the Ducktown Basin are pyrrhotite, pyrite, choleopyrite, spholerite, and magnetite. High copper zones (1.4 percent) exist in the perispheral bodies and low copper (0.70 percent) in the central ones. About 3000

samples were taken over four orebodies. These were pulverized to minus 40 mesh and about 20 g were retained for testing. A two-man crew ran an average of 60 determinations daily for zinc and copper using acetic acid, sodium hydroxide, and dithizone solution. Poor results were recorded in running copper and zinc on the same aliquot. Speed of determination was increased by using a mechanical shaker. By preparing a permanent suite of liquid colors, color comparison was expedited and made more accurate.

Results of tests were plotted to show relation to ore or magnetic anomalies. Four magnetic anomalies that appeared favorable geologically have been drilled and found barren. Drill core did not always yield high total content; zinc content was about normal and copper content negligible. A number of tests illustrate the generally unpredictable results, some of which were contrary to expectations.

In spite of anomalous results the distribution of the metals reflects a relationship to mineralization channels. The results of geochemical work at Ducktown indicate that the rapid technique will yield results that may be utilized to detect mineralization channels and contribute to finding ore.

Structural Geology at the Getchell Mine

By PETER JORALEMON
Former Geologist
Getchell Mines, Inc.

GEOLOGIC maps may become the most used tools of the ore-finding geologist. The Getchell mine illustrates how the structural control of an ore deposit may change with the scale of geologic thinking.

Geologic mapping on the scale of one mile to the inch may suggest to the geologist that the control of faulting and ore deposition might be a granodiorite contact with a limestone—argillite series. When viewed on the scale of 500 ft to the inch the fault becomes a complex fault system. The gold values now are defined as occurring not only in the fault but also along hanging and foot walls. Mapped on a scale of 30 ft to the inch, radical changes in the apparent ore control are observed. Finally, on a microscopic scale of 3000 diameters a large proportion of the gold particles actually are visible and the factors governing their deposition may be studied in detail. By combining all of these views of the deposits a clear idea of the structural control of the ore occurrence is defined.

Aerial Photography

By LEON T. ELIEL
Vice-President
Fairchild Aerial Surveys, Inc.

IN 1947 an area of 10,000 square miles lying 60 miles north of Cindad Bolivar, Venezuela, was mapped by aerial methods. A peculiar vegetation pattern developed in the mosaic and, upon investigation by a geological crew, this proved to be the great Cerro Bolivar iron ore deposit.

Aerial mapping has been used extensively in tracing critical faults. On the other hand, on reasonably flat terrain, a magnetometer might be used. In the event of a contemplated survey of a large area, the choice of method would be decided by cost. In the field of mining, surveys in the future likely will be conducted by both mapping and magnetometer methods. In the future, orderly development of mining properties no doubt will entail use of aerial mapping.

At present, the Orinoco Mining Co. is employing aerial mapping for the exploration of a possible route to more ore from the deposit to tide water. Costs of aerial mapping range from $1.00 a square mile up to $20.00 an acre. Time required to complete a survey depends on a wide range of factors, the principal ones being size of area and weather.

Extending Mineral Reserves with the Airborne Magnetometer

By HOMER JENSEN
Chief, Magnetometer Division
Aero Service Corp.

REASONS justifying calling the airborne magnetometer the most important geophysical tool may be summed up as: sensitivity, reliability, speed, economy and conclusiveness. Airborne magnetometers may be employed to conduct magnetic surveys with contour intervals of one gamma, although five and ten gamma contour intervals are more common. Reliability is evidenced by the operational record of the airborne magnetometer conducting surveys over areas ranging from the arctic to the tropics. Survey costs range from $7-$25 per linear mile.

Airborne magnetometers can be applied to a variety of geologic problems. They have been particularly successful in surveying fields where the ore sought is itself magnetic. Placer materials associated with magnetite have been successfully surveyed. Non-magnetic targets and magnetic host rock lend themselves to accurate airborne magnetometer surveys and structural problems have been accurately mapped.

Airborne magnetometer surveys can be applied successfully to finding extensions of ore bodies and to prospecting areas; new exploratory domains can be determined; geologically favorable areas can be established and regional reconnaissance undertaken with precision.

More than half a million square miles have been studied on five continents with the expenditure of millions of dollars. Some successful discoveries have been made which have more than paid for the millions spent in experimentation and study.

East Tintic District Geologic Picture Changed

By THOMAS S. LOVERING
Geologist
U. S. Geological Survey

MINE ore bodies found in basaltic rocks under a covering of lava are characteristice in the east Tintic district. About three years ago some churn drill holes were put down in an area of alteration well to the east of any known mineralization. The holes were abandoned at water level because of the difficulties encountered. The U. S. Geological Survey wanted the information to be obtained by a deeper hole, because the churn drill holes had proved the presence of

carbonate rocks where it was thought only Tintic quartzite lay. A diamond drill hole deepened to 1600 ft by the USGS showed that instead of being in the section of ground first anticipated, about 400 or 500 ft above the Tintic quartzite, the section covered was nearly 4000 or 5000 ft above the Tintic quartzite. An amazing section of carbonate rocks is exposed between the lava. In a section of substantial thickness, galena and sphalerite are visible.

Based on alteration and churn drill hole studies there is every indication that a large thrust fault can be followed many miles to the north where it goes under the lava. Thus in an area where it was previously thought there was no hope for any commercial mineralization whatever, an extremely interesting picture well worth further investigation is now presented.

PUBLIC LANDS

Session Chairman

W. H. H. CRANMER
President
New Park Mining Co.

Minerals Production and the Public Domain

By HONORABLE C. GIRARD DAVIDSON
Assistant Secretary of Interior

DEFENSE agencies will increase their call for many minerals. To meet total needs, productive capacity must be increased.

While concentrating on new methods provided in the Defense Production Act for expanding mineral production, the Government is continuing its attempts to clear away impediments which are hampering production.

One long-standing problem is the tax structure which inhibits exploration and production of minerals.

In the interest of the minerals industry, Interior Department has been exploring this problem with Treasury Department officials, who are giving sympathetic consideration to the characteristics of the mining industry.

Another impediment which is hindering the minerals industry from expanding production to the utmost is the Federal mining laws.

The Department of the Interior is not considering or contemplating any action or legislation which would apply the leasing system to hard-rock mining.

The laws could well stand some revision, and proper revision can remove the impediments the present laws place in the way of legitimate mining operations. But there is no intention to upset the apple cart merely to throw out a few bad apples.

Mining laws should be as simple as possible. They should contribute to the finding and producing of minerals on public lands. That means making it easy for minerals producers to operate within the laws.

Mining laws and accompanying regulations are not simple now. They make patenting of mining claims both slow and difficult. Objection has been raised to the necessity for exactly concurrent posting of notices and advertisements. Complaints have been made about nuisance filings on fractional areas adjacent to mining claims and it has been suggested that these should be subject to patent without discovery.

Conflict between claimants for the same location considerably slows the patenting process.

Some of these complications to which there is objection are in the regulations and not in the mining laws. A complete review of the regulations to make sure those causing trouble are removed if possible has been ordered. These regulations have been so bulwarked by court decisions, that they can be changed successfully only by changing the laws.

The mining industry is understandably and properly jealous of the mining laws and is interested in their being used only for the promotion of mining.

Invalid mining claims cause the Department much concern. However, these claims don't often come to attention unless the land is going to be used for a specific purpose. Further, if the land is not classified and reserved for another purpose such as a reservoir site, a military reservation, or a small tract, someone else can file another invalid mining claim as soon as the first one is cleared. If the mining laws were changed to make the clearance of invalid claims less cumbersome administratively, the taxpayer could be saved some money.

Everyone heartily favors the conservation of natural resources and the optimum use of public domain. These resources and this land belong to all; all have a vested interest in seeing it properly used and its benefits fully realized.

Constructive suggestions on how the mining laws might be revised have been submitted by miners, by stockmen, by timber operators, by recreation and wildlife enthusiasts, by city officials, by irrigation farmers, and by many others.

All these groups have claims to the public domain, and therefore something valuable to contribute to discussions on the mining laws.

Serious round-the-table discussions by all the interested parties are needed. Since the problems differ from region to region, these discussions might take place in a series of meetings held in different areas throughout the West.

It would be entirely appropriate for the mining industry, as in effect the custodian of the mining laws, to initiate such meetings. Invitations might go out to organizations representing grazing, lumbering, recreation, forestry, farming, health and sanitation, and other interests. If the Department of the Interior can help to work out a solution, it will be pleased to do so.

All the different groups concerned, after sitting around the table together ought to be able to come up with a proposal which all together can take to Congress next January and ask for its enactment into law.

Proposals for Changes in the Mining Laws

By DONALD A. CALLAHAN
President
Callahan Consolidated Mines, Inc.

MINING men cannot dismiss proposed changes in mining laws with the statement that such changes are not favored. Only after a complete unprejudiced examination should counter-proposals aimed at correcting present evils be made

in the interest of increasing production of essential metals and minerals.

Holders of unpatented mining claims are in conflict with the Bureau of Land Management and others in the following areas: the right of a mining claimant to the timber on his claim; rights-of-way across claims; livestock grazing on claims; monopolization of recreational resources by mining claimants; location of mining claims for purposes other than mining; holding of mining claims without any real development of mineral; careless locations of mining claims as regards boundaries; increasing difficulty of securing patents to mining claims. In addition the Bureau of Land Management complains that local filing only of location notices and proofs of labor on mining claims constitutes a handicap to proper conduct of the work of the Bureau.

Many of these questions, as well as others now raised by the Bureau of Land Management and the Interior Department, were also set forth in the Hoover Commission Task Force on Natural Resources report. Refutation of the charges against the mining industry and counter-proposals should come only after a thorough and complete study brings an understanding that will eliminate all confusion or uncertainty concerning the rights of the miner and his title to his claim.

Proposed Changes in Public Land Laws

By CHARLES F. WILLIS
State Secretary
Arizona Small Mine Operators Assn.
and
Chairman, Public Lands Committee
National Minerals Advisory Council

SINCE 1872 when first adopted, revision of U. S. mining laws has been discussed. The first major action came with the passage of the Mineral Leasing Act of 1920, which made no basic changes.

Originating during Mr. Ickes' administration of the Interior Department, current revision movements contain seven proposals which include Hoover task force recommendations.

In considering proposals, several questions occur: What are the problems confronting the Bureau of Land Management, the Forest service and other Government agencies, and will those problems be solved by the adoption of the seven proposals, and would solution in this manner be injurious to the development of our mineral reserves?

The first amendment advocated by the Bureau of Land Management suggests that notices of mining claims be filed with district office, as well as with the county recorder as at present. Benefits to be obtained from such duplicate filing are of small and doubtful value; little additional knowledge would be gained by the Bureau of Land Management concerning the public lands it administers.

The next proposal is that mining claims are to be adequately identified with reference to established public survey points or natural landmarks, the cost of such work to be allowed as part of the annual assessment work. A system of numbering claims to be instituted. In practical application of this proposal many difficulties will be encountered. Application of the cost of the survey toward assessment work would defeat the purpose of specifying annual labor. If the numbering clause relates only to identification of records in the district land office there can be no objection, but if questions of priority are involved that is another matter.

The third proposal states that a bill of particulars and proof of assessment work on mining claims must be filed with the Land Office as well as with the county recorder as at present. Observations regarding proposal one apply to proposal three. The fourth proposal provides that surplus assessment work performed in a given year be allowed, within reasonable limits, towards meeting assessment requirements in succeeding years. The performance of annual labor as a condition to maintaining an unpatented mining claim grew out of the judgment of miners, and it has been proved by years of experience. The fifth, sixth and seventh amendments are more technical and are discussed in greater detail in the paper by C. Jay Parkinson.

It is believed that a thorough joint study of the Bureau regulations, procedures and administration of the laws as they now exist should be undertaken to determine which, if any, abuses or improvements could be corrected or made without legislation. This should be the starting point to determine what is wrong with our established laws and practice, if anything.

Proposals to Revise Mining Laws

By C. JAY PARKINSON
Attorney
Salt Lake City, Utah

IT is intended in the fifth of the proposals advanced by the Bureau of Land Management that the three-year limitation affecting forfeiture applies to both the doing of assessment work and the filing of proof. Such interpretation arises from the clue contained in the last sentence of the proposal, which otherwise would be unnecessary. It is clear that what the Bureau wants to get at by such legislation is to provide an automatic, short-cut, conclusive, legislative forfeiture of mining locations without notice or hearing. It would do away effectively with the right to reinstate the validity of a claim by performing assessment work in some subsequent year but before an adverse location or appropriation by another has been made.

Proposal No. 6 provides that a locator whose claim has been "forfeited" or "adversed" to the Government cannot relocate, directly or indirectly, such claim or any portion thereof for three years. The only valid reason for such a provision is to prevent a locator, who has lost his claim by reason of failure to do the required assessment work, from circumventing the law by more or less immediate relocation. There are statutes in some States which specifically seek to prevent a claim owner from abandoning his claim annually and then immediately relocating to avoid assessment work. This does not mean the proposal is restricted to a claim forfeited for failure to do assessment work. It would apply with equal force to a claim owner whose claim was forfeited or adversed by reason of any defect in location or to one who deliberately abandoned the claim to seek a more advantageous relocation incorporating any part of the abandoned ground.

Under Proposal No. 6 the Government would retain right-of-way across any unpatented mining claim. Specifically, what is really desired is a law providing the retention by the Government of rights-of-way for any and all Government purposes and also for the use of Government permittees and licensees.

The proposal entirely ignores the very nature of mining where use of the surface is inseparably tied to the winning of the minerals from the ground and in many instances involves the mining of the very surface reserved. Other

people have conflicting interests on public lands. It is a subject requiring great cooperative consideration and profound and tolerant study. What may be a better solution than the one suggested is proffered in this framework of a plan to assist in resolving problems under discussion:

(1) That the mining industry actively oppose any further moratoriums on assessment work, except in extenuating circumstances and endorse the present law and pledging support in its equitable enforcement.

(2) That with cooperation of the mining industry and other interested groups a study be made and recommendations formulated to expedite the handling of patent proceedings and to resolve in a practical way the mounting problem of "discovery" within the framework of the present law.

(3) That only after the above work has been accomplished and after sufficient time for the results therefrom to become evident, should a real, down-to-earth, cooperative study be made to determine the advisability of changes in the law made with the agreement of all parties concerned.

The Phosphate Industry—What it Means to The West

By P. J. SHENON
Head, Dept. of Mining
University of Utah

ABOUT 85 percent of domestic phosphate rock is utilized as fertilizer; the remainder is used in chemical manufacture. Super phosphate with a P_2O_5 content of 16-20 percent is the most common form of fertilizer. Rock of plus 31 percent P_2O_5 content is required and about 0.6 tons of 100 percent H_2SO_4 is used for each ton of rock treated. Triple superphosphate, containing 42-50 percent P_2O_5, is rapidly becoming more important. Triple superphosphate, in the wet process, is made by treating high grade phosphate rock with H_2SO_4 to produce phosphoric acid. This is separated from the resulting calcium sulphate and is used to treat a further quantity of phosphate rock to produce the final product.

At Trail, B.C., phosphoric acid is combined with ammonia to produce highly concentrated fertilizer salt. Phosphoric acid is also produced by the "thermal reaction" process, in effect an electric smelting process.

Elemental phosphorous is produced by a smelting process. Phosphate rock mixed with coke and silica flux is heated to about 1600 C. Vaporized phosphorous is then collected under water as a heavy liquid. Ferrophosphorous present in the molten slag is produced as a by-product. Phosphoric acid is produced by burning the elemental phosphorous with an excess of air or oxygen and hydrating the resultant oxide.

Major companies active in the western phosphate fields are the Victor Chemical Co., International Minerals & Chemical Co., American Potash Co., Potash Co. of America, Western Fertilizer, DuPont, Monsanto and General Foods. Westvaco will install a third furnace at its Pocatello plant. The Victor Chemical Co. will build a $5,000,000 elemental phosphorous plant at Silver Falls, Mont. At Cascade Locks, Oreg., a thermal reaction process will be employed to produce triple superphosphate for the Columbia Electro-Chemical Phosphate Co. The Anaconda phosphate plant will increase its capacity of triple superphosphate and phosphoric acid by approximately 90 percent. Montana Phosphate Products Co. supplies the major part of the rock treated in Canada from its mines in Montana. J. R. Simplot Fertilizer Co. produces superphosphate on a large scale from ore mined at Fort Hall, Idaho, and also furnishes ore to the Westvaco Plant. At Leaf, Wyo., the San Francisco Chemical Co. sells rock to several plants.

Western phosphate deposits lie largely in Utah, Idaho, Wyoming and Montana, and are the most extensive known in the world. Postwar developments have been of tremendous importance and changing economic conditions indicate that western deposits can control the fast expanding western field. Already western plants manufacturing triple superphosphate compete as far east and south as Illinois, Missouri, Oklahoma and New Mexico.

Southern Idaho has two great advantages not enjoyed elsewhere; deposits of high grade phosphate rock 5-7 ft thick overlain by 18-25 ft of furnace-grade phosphatic shale that can be used in the manufacture of elemental phosphorous; sulphuric acid in large quantities is a by-product of western smelters.

PROGRESS IN UNDERGROUND PRODUCTION

Session Chairman
C. A. R. LAMBLY
General Superintendent
Pearl Creelle Mines & Metals Co.

Roof Bolting in Metal Mining

By MILTON C. McCALL
Chief, Accident Prevention & Health Division
Region VII, U. S. Bureau of Mines

SAFETY and maximum efficiency go hand in hand. This premise prompted the U. S. Bureau of Mines to sponsor roof bolting. Alabama management was quick to adopt this method of roof support and its use is approved by the miners. A comparison between roof bolting and post supports favors bolts. Each mine requires different treatment and strict adherence to a plan designed to fit conditions will give the desired results. Failures have been induced deliberately to determine the limitations of the system. Stoper drills are used to drill roof-bolt holes. Roof bolting does not give perfect roof control but failures have been preceded by ample warning. Bolting has been used successfully in holding roof that could not be supported by any conventional method of timbering. Advantages of roof bolting are larger tonnages mined, elimination of resetting timbers, improved ventilation, quicker installation as compared with timber, safer working places and less handling of waste.

Truck Haulage Power Plants

By C. R. BURTON
Superintendent of Maintenance
Oliver Iron Mining Co.

POWER plants and torque converters for ore production trucks on the Mesabi Range have become of increasing importance. Originally standard highway units were intro-

duced up to three tons capacity. Maneuverability and flexibility have resulted in increased use of trucks although they are not as efficient carriers as rail or conveyors. Stages in development of truck haulage on the Mesabi ranged from the 1½ ton payload, gasoline engine powered, to the 30-ton payload, tandem axle, 360-400-hp Diesel powered truck of today. Present wide range of engine selection results from changes and improvements in engine component parts and accessories. Engine lubrication has improved and cooling systems also have improved by adding directional cooling for the heads. Engine weight in pounds per brake horsepower has been lowered to approximately eight lb per horsepower. All present internal combustion engines have lower starting torques and are less efficient at starting speeds than at high speeds. The hydraulic torque converter has overcome this by supplying high starting torque. Operating principles of the hydraulic torque converter closely resemble those of a steam turbine. Some of the advantages of torque converters are less maintenance of machines, less driver's skill required, lessening of driver's fatigue, and increased unit production. Approximately 45 torque-converter-equipped production trucks are in use on the Mesabi today.

C. R. Burton

Trackless Mechanized Mining in the Lead Belt

By R. T. MURRILL
General Mine Superintendent
and
PETER B. NALLE
Mine Engineer
St. Joseph Lead Co.

PART I of this article was published in the September issue of MINING CONGRESS JOURNAL. Part II appears on page 41 of this issue.

Applicability of Oil-Shale Mining Developments to the Mining Industry

By EMERY M. SIPRELLE
and
HOMER J. BALLINGER
U. S. Bureau of Mines, Rifle, Colo.

SINCE 1944 the U. S. Bureau of Mines has been engaged in opening up and operating an experimental mine in the oil-shale beds of the Green River formation near Rifle, Colo. The mine is being operated to develop mining methods, equipment and procedures and to establish firm cost estimates for mining these vast deposits of oil shale. Items of special interest to the mining industry include the compressor utility station featuring mobility that mounts two 770-cfm air compressors (see MINING CONGRESS JOURNAL, March, 1950.)

A four-drill jumbo designed to drive the 27 ft high by 60 ft wide headings, leaving 60-ft square pillars, has already been applied to limestone breaking in mines located along the Mississippi Valley.

Blast holes are loaded from a Wagnermobile Special Duo-Way Lift machine equipped with 23-ft vertical tracks. Scaling, originally conducted from truck beds, is now accomplished from a unit devised on the pantograph principle, comprising a self-leveling platform and a ladder mounted on the boom of a superior revolving crane used with an International TD-9 tractor. With the boom raised nearly vertical, the platform is about 24 ft above the floor.

An additional scaling platform for scaling the second bench with an over-all height of 49 ft has a four-section tower which may be extended to a maximum height of 65 ft. These rigs not only serve as scaling units but also rock drills can be easily operated from the platform.

Research on efficient mining machines, mining cycles and means of obtaining minimum costs are of interest and value to industry. Rotary drills have proven, in oil shale, to afford much greater drilling speed, no appreciable loss in speed with depth of hole and more efficient use of power. Drill steels have been tested with interesting results and determinations have been made of the drilling life and energy-transmission characteristics of four types of alloy rods.

Blasting research has been conducted to seek a correlation of the measured strains against the breaking characteristics of the rocks being blasted. Barodynamics tests have proven that the maximum safe unsupported roof span attainable was 200 ft. Equipment and procedures for roof stone studies and mine structure stress analysis could well be applied to predict safe mine-structure design throughout the mining industry.

ATOMIC ENERGY

Session Chairman
BLAIR BURWELL
President
Minerals Engineering Co.

The Outlook for Atomic Energy

By LAWRENCE R. HAFSTAD
Director, Division of Reactor Development
U. S. Atomic Energy Commission

REACTOR development must look to the mining industry for the raw material of atomic energy. Mining men may be among the first who will use atomic energy for industrial power.

Atomic energy will be expensive and electric power from atomic energy is going to be expensive. Its use will come in selected cases and in isolated areas.

Although present use of atomic energy is mainly military, civilian use is growing. Isotopes have already accomplished remarkable things in medicine. Atomic energy and its by-products have been applied to the development of new techniques and new materials. However industrial power will be the real contribution from atomic energy. Opinion on this possibility is divided, one group citing the shortage of materials and the cost of conversion of uranium into electrical energy. Another group emphasizes cessation of the use of atomic energy for military pur-

poses and urges its use for civilian power, electrical power to usher in an era of atomic ease and comfort.

Atomic energy problems are in two categories; first is the limited supply and second the complicated technology. There are many technical difficulties involved in converting heat provided by atomic energy into electrical energy by conventional means. Looking at the facts as they are at the present time, prospects of industrial power are pretty slim. However, costs will be reduced and advances made in technology over the next 10 or 20 years that will probably make atomic power competitive with that produced from other sources in some cases.

Technical developments in other fields indicate what we are up against in atomic energy over the coming 20 years or so. If history repeats itself eventually, short cuts will be found which will make atomic energy cheaper. In the meantime extensive research will be conducted and research for uses which will justify power from atomic sources continues.

Problems met in developing atomic energy for power production forced development of a whole new technology of unusual materials, and unusual metals. To obtain energy, U-235 must be separated from U-238 and represents only 0.7 of one percent of the total uranium metal available. We must learn to use the rest of the uranium and this seems not impossible. A reactor using "breeding process" is being constructed at the Arco Proving Grounds of the AEC and the reactor should be in operation in 1951. Another reactor under construction is the materials testing unit and a third is designed to propel Navy vessels.

A fourth reactor, originally a power breeder reactor, was being used to extend knowledge on the attractive possibility of converting U-238 into U-235.

Investment in an ordinary steam station runs approximately $133 per kilowatt hour of capacity. The cost of the Naval Reactor designed to produce electric power runs about $1400 per kilowatt of capacity. Savings will be developed as we learn more in the future.

Uranium Procurement Policies

By JESSE C. JOHNSON
Manager Raw Materials Operations
U. S. Atomic Energy Commission

IN the spring of 1948 when the Atomic Energy Commission announced an ore-buying program with a definite schedule of prices, there were only 15 individual operations employing a total of 55 men that were active on the Colorado Plateau. Today there are over 200 privately owned operations with a total employment in excess of 1000 and ore production is at an all-time high. Over 80 percent of the ore produced is processed in privately operated plants. This growth indicates that uranium mining can be a profitable business as new operations are not undertaken and existing ones expanded unless a profit motive exists.

To maintain and increase ore reserves the Commission is continuing its exploration program of the Colorado Plateau including 300,000-400,000 ft of diamond drilling a year. New sources of production found on public domain are being made available for private mining under lease arrangements. In addition, geologists are examining prospects in Colorado, Utah, Arizona, New Mexico, Nevada, Wyoming, Idaho, Montana and Michigan.

For high grade pitchblende ore the Commission's buying schedules and policies are outlined in Circular No. 1, which established a ten-year guaranteed minimum price for high grade ores and concentrates. Provision was made in Circular No. 1 schedule for special arrangements under negotiated contracts when justified by the quantity and cost of production. Circular No. 5 was set up to apply to carnotite ores of the Colorado Plateau. Purchase schedules for crude ore not covered by Circulars No. 1 and No. 5 will be established for each mill. New ore buying schedules call for a price of $2.50 to $3 per pound of U_3O_8 content, depending upon grade, delivered at a mill. Price includes a development allowance of 50¢ per pound of U_3O_8 content; in addition, a haulage allowance may be granted to defray part of the cost of moving the ore from mine to mill; ore specifications will be established by each mill and ore which does not meet specifications will not be accepted. Metallurgical tests may be required to determine acceptability. The minimum U_3O_8 content for an acceptable ore may range from 0.20-0.30 percent U_3O_8, depending upon the type of ore; payment may be made for other valuable constituents provided the receiving mill can recover them economically.

The market for uranium is here to stay . . . as long as the Government is the sole purchaser of uranium and industry must depend upon the Government for its market, the Government must give adequate guarantee both as to price and the period of purchase, if industry is to finance and operate uranium mines and plants. The price policy outlined here will remain in effect until March 31, 1958, subject only to changes or modifications which will not be less favorable to the producers. Thus there is an assured market for uranium ore at minimum prices for approximately eight years.

Economics of Domestic Uranium Production

By FRANK H. MacPHERSON
Manager, Colorado Raw Materials Operations
U. S. Atomic Energy Commission

CONDITIONS and problems of uranium mining and milling were discussed in detail. Favorable conditions include the absence of deep shafts and expensive hoisting equipment; pumping; elaborate underground electric systems; and a minimum of the usual deadwork done in many deep mines. The ground breaks easily and powder consumption is low. Extensive timbering is not necessary and there is an immediate market with a minimum guaranteed price; there are no deductions for milling costs.

Deposits range in size from a few hundred tons up to deposits which contain as much as 100,000 tons; one ore body is expected to produce in excess of a million tons of acceptable uranium-vanadium ore. Subsurface prospecting has been successfully undertaken by diamond drilling and the cost is moderate because of the shallow depth of the ore in many localities.

Figures demonstrate the importance of careful mining:

% U_3O_8	% V_2O_5	% H_2O	$ ton
0.10	0.80	4	10.71
0.20	1.60	4	23.67
0.60	4.80	4	66.01

These prices include development allowance and payment for average haul of 60 miles. These returns are based on the prices for uranium-vanadium ores established by the Commission in its Circular No. 5.

With the policy of the Atomic Energy Commission to leave actual mining and milling of uranium ores to private

industry wherever possible and to purchase the uranium and vanadium products from the mill for a definite period at a definite price, the mining operations on the Colorado Plateau have been progressing satisfactorily. Many new mines have started production during that time and new processing plants have been put into operation.

Geologic Guides to Carnotite Deposits on the Colorado Plateau

By DORIS H. BLACKMAN
Geologist, Minerals Deposits Branch
U. S. Geological Survey

CARNOTITE deposits of the Colorado Plateau have been the principal domestic source of uranium and vanadium. Several of the geologic features associated with these deposits have been of considerable value in prospecting and are now being successfully used by the U. S. Geological Survey in its program of exploration drilling on the Colorado Plateau.

Carnotite deposits occur in lenticular sandstone beds. Beds less than 40 ft thick rarely contain sizable ore deposits. Sandstone that is pale to light brown in color and speckled with limonite stain is most favorable; sandstone with a pronounced reddish cast contains few deposits. Mudstone associated with the sandstone is normally red but near ore deposits it is altered to gray; this alteration is an indicator of ground favorable for ore. The presence of abundant carbonized plant remains in the ore-bearing sandstone is another useful guide when used in conjunction with other criteria. Quantitive expressions of the value of these geologic features as guides to ore have been established as a result of recent studies by the U. S. Geological Survey, based on geologic logs of more than 2500 drill holes.

Processing Uranium Ores

By FRANK W. McQUISTON, Jr.
Met. Advisor on Raw Materials
U. S. Atomic Energy Commission

THIS article appears in full beginning on page 28 of this issue.

NEW DEVELOPMENTS IN DRILLING AND BLASTING

Session Chairman

E. R. BORCHERDT
Research Engineer
Anaconda Copper Mining Co.

Problems of Underground Rock Breaking

By J. FRED JOHNSON
Manager of Operations, Western Mining Department
American Smelting & Refining Co.

GREATER economy in underground mining has been realized by the combination of perfection of detachable drill bits by United States manufacturers, the adoption of Canadian practice in extensive use of one-pass or throw-away bits, and the adoption of tungsten-carbide insert bits in rock drilling. Concurrent with these developments has been the adoption of new drilling ideas which, in the main, consist simply of breaking rock with holes of smaller diameter. This has resulted in greatly increased production per man shift, a reduction of 25-50 percent in air and explosives consumption, and a larger reduction in capital and maintenance costs directly attributable to the simplified facilities and equipment required to service and maintain the mine plant.

Inasmuch as the mining industry deals with the drilling of materials of different characteristics of hardness, toughness, structure and shattering, records show a range of between 19,000 ft of drilling with a single bit in the most favorable rock and 120 bits to drill one 5-ft hole at the unfavorable end of the scale. Over the years a vicious circle had developed that culminated in larger drilling equipment of all kinds. Today, as a result of engineering, it is well known that a correlation must exist between drill steel cross-section, diameter of bit, and size of drilling machine to achieve maximum results. Savings achieved by the new technique should pay quickly for discarding of old equipment. Listed below are a number of general procedure practices and some of the more obvious pitfalls to be avoided in the tests. A constant air pressure that should not fall below 90 lb and great variations in water pressure should be avoided. Type of drill rod and drill bit should be selected carefully. Start tests with small diameter holes and change to large diameters if necessary. When choice has been narrowed down to two machines, leave both in a contract heading and note which the miner uses.

—*Discussion*—

J. C. Heaslip (*Manager, Detachable Bit Division, Canadian Ingersoll-Rand Co.*): Tungsten-carbide tipped rock drill bits constitute the greatest single advancement in rock drilling practice since the advent of percussion drills. Evolution of rock drills has culminated in today's highly refined drilling machines. With development of small diameter tungsten-carbide bits, drilling rock with light weight equipment was solved and jack hammer air feed leg possibilities were explored. Canadian operators investigated the savings and application of the combination and results indicate that it has found a place in Canadian mining practice. The heavy labor of conventional rock drilling practice has been relieved by use of the lighter drill mounted on the controlled pneumatic leg. A recent survey reveals that a large increase in footage per shift results with a 50 percent saving in capital outlay. Appreciable saving in air and powder also results and no set-up time is required. In

keeping with these savings is an increase in tonnage broken per man-shift or a lower cost per ton of ore broken.

Breaking down mine development into two sections—main levels and large ore development—the controversy of whether the combination is efficient for main level developments still exists. Jack hammer-air feed legs save on initial cost and allow increased portability as one man can carry the complete unit. Units of this sort have proved valuable for large orebody development, undercutting, shaft sinking, and in slushing and breaking.

Surveys prove that the majority of Canadian operators prefer detachable bits. Experience has proved that proper grinding at the right time is the greatest single factor in utilization of tungsten-carbide bits. Footage obtained is governed by the type of ground drilled coupled with care and attention the bits receive. Drill rods are undergoing change of design with no set pattern. Performance tests have been run to determine the adaptability of bits to various types of drilling. Standard or conventional drilling machines cannot match the flexibility of the light weight equipment.

A recent test using air feed legs mounting jackhammers with small diameter carbide bits and 3½ in. column mounted drifters with larger diameter bits indicates superior performance and better efficiency in favor of properly mounted drifter drills with comparable diameter carbide bits, but on the whole it can be stated that tests made to date indicate that operators and miners conclude the combination of air feed leg mountings and carbide bits offers an increasing range of application in stoping, subdrifting and slushing.

An Over-all Look at Rock Drill Bits

By JAMES D. FORRESTER, Head, Mining Dept.
Missouri School of Mines & Metallurgy

THIS article will be published in the November and December issues of MINING CONGRESS JOURNAL.

Progress in Blasting Procedures

By J. M. EHRHORN
Superintendent, U. S. Section, U. S. & Lark Mine
U. S. Smelting Refining & Mining Co.

IMPROVEMENTS in blasting procedures are developed in order to improve safety or efficiency. Complete safety in handling explosives is the Utopian aim of explosives users. The safety records of the National Safety Council show some extraordinary achievements safety-wise in the use and handling of explosives. Improved efficiency results from such factors as lower explosive consumption, improved fragmentation, cleaner breakage, reduced backbreak, reduced throw, reduced vibration and reduced formation of gases. All tend to lower unit costs.

Progress has been made in blasting procedures along the following lines: more practical safety codes, increased use of ammonium nitrate and semi-gelatin powders, packaging of explosives in containers suitable for the use, development of primacord, short-period electric delay caps, ignitacord and connectors, positive spitting devices and stemming. The extraordinary safety records that have been compiled by many mining companies in the field of safety are not the result of chance. They are the results of careful attention to training qualified personnel to use explosives and strict adherence to all safety rules and regulations and observance of the penalties of violations.

Nitroglycerin has been and still is the basis in the mining industry on which the power of explosives is based. No more-powerful substitute has been developed to replace nitroglycerin. Its sensitivity prevents use at full strength. Gradually however other less sensitive ingredients have been replacing nitroglycerin until present powders are composed of combustible material, sodium nitrate, ammonium nitrate and nitroglycerin. Ammonium nitrate explosives are less expensive than nitroglycerine dynamite and occupy more volume.

J. M. Ehrhorn

Explosives packaged for the purpose for which they are intended are being increasingly used. Drilling developments which provide a uniform size hole, and a smaller hole have resulted in the use of smaller diameter sticks. Most operators report savings of up to 30 per cent in powder consumption as the result of smaller drill holes.

Improvements in detonating methods have come as the length of drill holes has been increased. Modern blasting practices have resulted in an increase in duty per pound of explosives from an average of four-five to as much as nine and ten tons per pound of explosives, thus the increased cost due to improvements is more than offset by the increase in duty.

The past several decades have witnessed notable steps along the road toward a utopia where explosives can be made, handled and used efficiently without accidents. Further improvements will probably result in a further decrease in the size of holes drilled. Smaller holes will require a greater explosive force, and chemists therefore will have to compound a more powerful substitute for nitroglycerine. Heretofore in the explosive field we have been limited to splitting the molecule. When the techniques of splitting the atom are applied to blasting practices our present practices will be outmoded.

Blasting Cross-Cut Rounds with Millisecond Delays and No Cut Holes

By WING G. AGNEW
Chief Mt. Weather Branch
U. S. Bureau of Mines, Bluemont, Va.

AFTER early experiments in blasting raise rounds with millisecond delays (MINING CONGRESS JOURNAL, April and October, 1949) trials were conducted in blasting 7 by 7 ft horizontal headings with millisecond delays.

Rounds used 25 holes and varied in depth from 5-8 ft. Rounds 5 ft in depth were broken without any bootlegs. Holes are equally spaced 21 in. apart. Hole diameter is 2 in. from collar to bottom. Primer cartridges are loaded in the bottoms of the holes and two cartridges of sand stemming are used.

Present data reveal that it is possible to break a longer round with from one to three fewer holes, all drilled straight in. Rock broken per round is finer. Tremendous muck scatter and damage to timber are disadvantages of this method.

Research work on this method of blasting will continue and details of similar experiments conducted in the field are sought for trial at Mt. Weather.

TAXATION—PUBLIC RELATIONS—SILVER

Session Chairman

WORTHEN BRADLEY
President
Bradley Mining Co.

Revenue Legislation in 1950

By WILLIAM I. POWELL
American Mining Congress

ADMINISTRATION forces made a general attack on percentage depletion when appearing before the tax-writing Ways and Means Committee. The mining industry testifying before the same committee answered this attack and established a strong and valid basis for retaining, as well as increasing, present depletion allowances.

House provisions in the pending "Interim Tax Bill" could have highly adverse effects on the mining industry—two of which were (1) Section 204, under which "transportation beyond the property" would be excluded in determining gross income from the property for computing percentage depletion; and (2) Section 209, under which losses on abandonment or sale of capital assets or property used in trade or business would be deductible only against capital gain. The Senate has removed these harmful provisions from the bill and it is hoped that they have been permanently removed from this and all future tax legislation. There is a strong possibility of an excess profits tax being enacted this fall or in early 1951.

If an excess profits tax is proposed the mining industry must strive to have enacted a fair "profits tax"—one that will tax only *true* excess profits—a tax that will recognize that where a mine increases its production in response to the government's call for more minerals and thereby exhausts its ore reserves at an accelerated rate, it is not making an excess profit if the profit per unit—that is, per pound of metal or per ton of ore—is no greater than before.

Whatever the future brings taxwise, it is hoped that the government will see the wisdom of establishing a tax climate that will give full recognition to the special problems of the mining industry and be guided accordingly. To this end our efforts should be directed.

Mining Taxation Problem As I See It

By L. J. RANDALL
C.P.A. and Comptroller of
Hecla Mining Co.

FAIR-MINDED individuals are convinced that the mining industry is entitled to the tax relief requested as a matter of equity.

Increased exploration will result in bringing new mines into profitable production and the Government will share in those profits.

A three-year tax-free period from the date the mine reaches a commercial production status would result in an increase in exploration and development of new mineral deposits.

It is felt that the proposed revision in our tax laws to deduct development costs incurred after the discovery of an ore body as operating expenses would not only encourage development, but would also result in more efficient mining operations.

L. J. Randall

Undoubtedly more money would be expended for exploration and development of new deposits if the speculator were assured that any loss sustained would be a legitimate deduction against income from other sources.

The present 15 percent depletion allowance does not adequately provide for the extreme speculative nature of mining. An increase in the percentage depletion allowance, plus removal of the 50 percent limitation, would attract new private capital to the mining industry.

There is a growing sentimate in some government circles that private capital cannot, nor will not, do the job, and that society must look to the government to explore and develop our natural resources. This is an extremely dangerous trend that can only lead to government ownership of our natural resources.

Exploration and development of new deposits have been greatly curtailed recently. However, you will no doubt find that the decrease is directly proportional, or at least definitely related, to the increase in tax rates imposed upon the industry during the past ten years.

The six major amendments to our tax laws, requested by the mineral industry, will accomplish the same objective that government participation might achieve.

Present-Day Tax Policy in the Mining Industry

By GRANVILLE S. BORDEN
Attorney
San Francisco

OUR goal is the discovery and development of strategic and critical metals in amounts adequate to meet military and civil requirements. Achievement will require tremendous collective efforts by enterpreneurs, labor, land owners, lawmakers, artisans of government policy, and the parties who administer Federal and State laws.

A substantial fund of American dollars is required to prospect, explore, develop and produce. If the tax law takes the major portion of the winnings of those who are successful, these activities will cease. Ore deposits will become depleted and ventures will fold.

What can be done? Prospectors and miners can take to the field and exercise the fullest use of technical and financial abilities. Those who work for the prospectors and miners have an obligation to support their efforts; strikes, slow-downs, boycotts and jurisdictional grievances play right into the Communists' hands. The Administration can wake up. Development of strategic domestic resources transcends in importance programs of paying

bonuses for nonproduction and for purchase of commodities to give away or destroy.

Lawmakers have a manifold reformation to make. Slick tricks intended to destroy incentives to explore should cease. Exploration would have been effectively sterilized by the House-passed tax bill containing a provision indirectly disallowing deductions from taxable income for explorational losses. Congress should stop insisting that Government contracts on war production of minerals be renegotiated. Unless this action is taken, speculative capital for prospecting and development will not be remunerated at rates commensurate with the risk.

Discrimination against producers of mineral resources should cease. Income tax laws by which taxes are imposed on long-term gains at ordinary normal and surtax rates, as the producer sells his mineral deposits in a series of sales, in normal course of production, are unjust.

Further, the Internal Revenue Code should be amended to eliminate limitations on carry-back and carry-over losses, unfair rules pertaining to depreciation and the treatment of exploratory expenditures. Legislation proposed by the National Minerals Advisory Council and the American Mining Congress should be enacted. Any excess profits tax law should provide relief for abnormal profits from production of minerals not exempt, when producers are requested to accelerate production and profits are concentrated in a shorter number of taxable years.

Administrators of Federal tax laws should stop impeding exploration, development and production by construing the laws as unfavorably as possible for the miner. For the duration, at least, they should lean over backward to help the Nation procure raw materials indispensable to victory.

Realization that this nation is at war and vulnerable to defeat if domestic commercial resources are inadequate should be a potent incentive to cooperation along the indicated lines. Action must be taken now to make the many changes vital to National security.

Bureau of Mines Considers Taxation Problems

By DR. JAMES BOYD
Director
Bureau of Mines

AN emergency condition exists which is going to be costly to the nation as a whole and to individual taxpayers.

Problems we face are those of maintaining the tax income of the country to pay for the cost of war; and to reduce operations of the Government, insofar as they can be during that period. Recommendations of the National Minerals Advisory Council supplemented by the recommendations of the American Mining Congress, were analyzed and presented to the Treasury Department to bring to them an understanding of the problems which the industry faces in producing the requirements of the war machine and of the economy as a whole.

A major problem of the mineral industry is the development of new resources. There should be no great difficulty in providing the total amount of metallic war materials from either domestic or foreign sources to meet present needs of the industrial economy or that of the war machine. However, future demands might alter this and the need for full development of new resources requires the Department of Interior to take much greater cognizance of the over-all problems of the industry.

Department of Interior will be the only agency of the Government to which the industry need turn for advice and assistance in its operations. It is recognized for the first time that the industry does need some place in the Government where it can bring its problems.

Tax economists of the Department of Interior have studied the history of the industry and have come to tentative conclusions, which can not yet be discussed. Some of their findings do and others do not support the industry's tax program.

It is hoped by the time the next tax bill is presented to Congress an understanding with the Treasury Department will have been reached which can support those proposals which will do the most good in your industry.

Public Relations and Public Opinion

By CHARLES M. HACKETT
Executive Assistant, Public Relations Department
E. I. du Pont de Nemours & Co., Inc.

PUBLIC opinion today is the result of the expressions of views by the Average American, who is more articulate, better educated, and has ready access to more numerous informational facilities than his father or grandfather.

For these reasons, today's average American is more concerned with national problems and has an important effect upon the determination of policies bearing on industry.

Public opinion has moved very definitely towards the left in the past two decades because of: (1) a wide misunderstanding of the basic economic principles among large numbers of the labor force, (2) the fact that 72,000,000 Americans in all of their adult lives have never known a normal period of business activity, (3) the complexity of modern society and the confusion surrounding many areas of economic thought.

Industry's greatest public relations job is to make sure that it is judged by the Average American in the light of all the facts and not on the basis of the half-truths, the distortions, and the indifferences which have so frequently prevailed in the past. The educational job cannot be delegated to a group or to an association. It cannot be done by the Chamber of Commerce or the National Association of Manufacturers or by the American Mining Congress. It can be done only through each company's contact with its stockholders, its neighbors, and with its own employes. It cannot be done in a month or a year but only by a long term continuing program.

To accomplish this, the prime approach to the industrial employe is his natural interest in his job. Management must make sure that its employes understand the company and its problems, the economic framework within which the industry must operate, and the importance of each job. This can be done through employe publications, by sponsoring visits of employes' families to the plants, and by keeping all foremen and supervisors informed of company policies and thinking. Such tasks should be placed in the hands of skilled careful men who know all the techniques of popular appeal.

It is imperative that if business wants to be understood and properly evaluated it must go to the people directly, each business to its own people. Once that is done, and once the proper local understanding is built all over the nation, the cumulative effect will be such that business need fear no attack. Political pressure groups and political parties advocate what the public wants and they oppose what the public does not want. If it is plain to all that business and the public want the same thing, the problem is solved.

Public Relations—The Importance of the Stockholder

By JAMES E. HOGLE
Assistant to President
Rico Argentine Mining Co.

IT is important that stockholders of mining companies be informed of the problems of their company and of the mining industry in order that they may voice their views when matters affecting the industry are being considered by Congress.

This support is particularly valuable in such matters as tax revision to encourage mineral production and development.

There are naturally diverse and sometimes conflicting policies among the companies engaged in the mining industry. However, it does seem logical that the entire industry can unite upon the tax program as set forth so ably by the National Minerals Advisory Council. Support in Washington is needed at the proper time and if only a segment of the owners and employes in the mining industry, say fifty to one hundred thousand, expressed its views it would have more influence than any man, group of leaders within the industry, or any committee which could wait upon the Ways and Means Committee, or the Senate Finance Committee.

To accomplish this each mining company must resolve that it will educate its stockholders and employes that its major problem is one of taxation as it affects the mining industry. That in addition in as interesting and educational a manner as possible, it will acquaint them with the details. Armed with that knowledge, thousands should assert themselves to their Representatives in Congress.

The stockholder is the forgotten man in mining. He does not understand the tax problems which include such complex matters as depletion. Bringing these problems to him in a way that he can understand will win his support. The stockholders could be the source of a tremendous new power for the mining industry, and no industry needs a new source of support more.

Who's Right About Silver

By DAVID HINSHAW
Noted Author
(Presented by William Dawson, Former Congressman from Utah)

BUYING of domestic silver by the Treasury is vital to the existence of the silver producers. It is necessary continually to remind the members of Congress and the general public, who do not realize that the production of silver has been, and will continue to be, just as important to our domestic economy and our national defense as the aviation industry. It is admitted that government buying of silver is a form of subsidy. It is, however, a subsidy which is fully justified, when it is realized that low grade ores can only be made profitable through the recovery of the silver that they contain. Of the many small mining companies operating in the important copper, lead and zinc producing state of Utah, only two companies showed a profit in 1949. Had it not been for the recovery of silver these two companies would not be in operation, and yet in that same year they contributed over 24,000,000 lb of zinc, 20,000,000 lb of lead and 800,000 lb of copper to the National economy.

In addition to making possible this production of strategic metals from low grade ores, silver itself has been useful. Stockpiled Government silver was substituted for copper in many instances during World War II. Under the Marshall Plan we are now sending silver abroad to help bolster foreign currency. The general opinion is that a subsidy costs the Government money; in the case of silver, the contrary is true. On the purchase of 611,000,000 oz of domestic silver the Government has made a profit of $331,000,000. The silver purchase program has called for neither a budget cost to the Government nor a congressional appropriation.

Many antagonists of the silver program contend that the Government should replace silver certificates by Federal Reserve notes, which must carry a gold reserve of 40 percent. Actually what troubles the silver subsidy critics is that they are against the use of silver as an integral part of our monetary system. When the cost of the silver purchase program is fairly assessed, the program's contribution to National income and tax revenues via the stimulation of domestic nonferrous metal production must also be fairly assessed.

The country is now entering upon a program of intensive mobilization. Stockpiling of strategic minerals and other needed materials is an urgent necessity. No one can predict silver requirements should the Nation again become involved in all-out war. It is the job of the mining industry to let Congress and the general public know the importance of the Treasury's domestic silver buying policy. It is vital to the entire nonferrous mining industry that the silver purchase program continue.

ADVANCES IN MILLING PROCESSES

Session Chairman
E. J. DUGGAN
Vice-president
Climax Uranium Co.

Fluo-Solids Roasting of Sulphides

By T. B. COUNSELMAN
Manager, Fluo-Solids Division
The Dorr Co.

FLUO-SOLIDS is the partial suspension of solid particles in an upward moving stream of gas that will seek its own level like a liquid. Each particle is surrounded individually by a film of gas or air. Heat may be applied to sulphide concentrates or ore and when the solids are heated the sulphur furnishes the fuel to supply the heat. Calcined solids overflow the discharge pipe to be withdrawn through a suitable seal as overflow product from the reactor or the fine calcines are entrained with the products of combustion and swept upward and out of the reactor.

No moving parts are exposed to high temperatures inside the reactor and refractory life is exceptionally long. Temperature is uniform throughout the bed and gas com-

position is under accurate control. The system is completely instrumentized. Feeding as a slurry avoids the necessity of pre-drying or handling filter cokes. Gold ores, pyrites and zinc and copper concentrate roasting are handled successfully.

Fluo-Solids Roasting at The Bureau of Mines

By STUART R. ZIMMERLY
Chief
and
A. E. BACK
Metallurgist,
Salt Lake Experiment Station
U. S. Bureau of Mines

PRECISE temperature control, relatively large capacity, and definite control of the roasting atmosphere are features of the Fluo-Solids reactor. Feed is dried before charging. Roasting tests have been made on arsenical gold-bearing ores for the elimination of arsenic and sulphur and on tailings for the elimination of carbon to free the gold for cyanidation.

An arsenical gold ore from which only 38 percent of the gold could be recovered by direct cyanidation was roasted in the Fluo-Solids unit and the resulting calcine cyanidation showed a gold recovery of 79 percent. A 15 percent SO_2 roaster gas was produced from the 1.5 percent sulphide ore.

A. E. Back

Fluo-Solids has another possible application in the "baking" of ores to improve settling, filtering and washing characteristics. Certain carnotite sandstone ores which contain a claylike material that slimes during leaching and prevents clarification have been roasted at 400-425 C., resulting in a product with improved filterability from which uranium could be recovered with an efficiency equal to or superior to results obtained when a conventional multiple-hearth roaster was employed.

Current investigations have been limited to temperatures 950 C. or less employing a stainless steel reactor. A high temperature unit equipped with a silicon carbide reactor tube is being installed to explore high-temperature roasting and chlorination of metallurgical products.

Plans For Treating Greater Butte Ores

By F. F. FRICK
Research Engineer
Anaconda Copper Mining Co.

APPROXIMATELY 130,000,000 tons of copper ore containing 20 lb of recoverable copper per ton will be won from the "Greater Butte Project." Certain areas to be mined have been isolated in the past because of fires and subsequently filled with concentrator tailings. An estimated 9,000,000 tons of flotation tailings will be required and will not contribute to the recoverable copper of the ore body. Thirty million tons of oxidized ore that does not respond satisfactorily to standard alkaline circuit flotation will be mined from the upper levels, the 100,000,000 tons of deeper lying ore is to be treated in a conventional lime-xanthate flotation circuit without desliming. In the oxidized ore a complicated slime problem was posed by the fact that the slime contains a large proportion of copper in sulphide form and the balance, after leaching, in soluble form.

The Leach-Precipitation-Float process was decided upon and sponge iron was selected as the precipitant. The process involves scouring the ore with sulphuric acid to give a solution of about 2 pH. The resulting slime contains about 15 percent solids. Sands pass directly to a lime-xanthate flotation circuit and slime overflowing the circuit is treated with sponge iron to precipitate soluble copper and the resulting pulp is floated in an acid circuit. Copper recovery is 85 percent in a concentrate running about 18 percent copper. This concentrate will join that produced from sand and regular copper ore and pass to thickening and filtration.

Sponge iron is supplied to the plant at minus 35 mesh. At Anaconda a high grade iron calcine results from the roasting of pyrite concentrate in producing sulphuric acid. Natural gas and slack coal are available at fair prices. A mixture of coke and calcine is heated to about 1850 F at which temperature the iron is reduced to the extent of 85-90 percent. To prevent reoxidation of the iron the product will be sent to a Baker type cooler sealed from air entry at both ends. The cooled product will then be crushed, screened, and processed to a final minus 35 mesh product containing about 50 percent metallic iron.

Grinding with Centrifuged Media

By A. W. FAHRENWALD
Director, School of Mines
University of Idaho

FOLLOWING an introduction describing the results obtained by Coghill and McVeney using substances of specific gravities varying between 2.89 and 7.3, Dean Fahrenwald concludes that no economic substitute possessing the requisite physical properties apparently exists for steel ball grinding media. A logical factor for research is centrifugal force, the tumbling-media relationship being known, and a machine was built in which the ball charge tumbled in ball-mill fashion under the action of centrifugal force. Condition and results listed hereunder are drawn from a total of more than 200 individual tests employing mills of 6 in. and 12 in. diam. *Condition I.* A single ball spins on its axis and rolls on the mill wall. *Condition II.* A ball mass (media) is fluidized and is caused to flow under centrifugal pressure and conditions like that of the rock slide. *Condition III.* With the mill charged more than one-half full, at higher speed and smaller radius of gyration, the mass expands to half again its static volume without any tendency to flow or race. Centrifugal ball mill test data for two representative tests, data for second test in parentheses ( ), with gravity ball mill data in brackets [ ] follow. Time of grind: 2 (10) [10]; mill size: 6 (6) [6]; orbital speed, rpm: 180 (180) [0]; rpm: 90 (90) [90]; ball size: ¾ (¾) [¾]; ball weight, grams: 1800 (1800) [1800]; feed weight, grams: 200 (200) [200]; water, grams: 200 (200) [200]; percent solids by weight: 50 (50) [50]; density: 1.45 (1.45) [1.45]; minus 200 mesh product, total 56 (185) [73]; ball potency compared to gravity mill: 3.90 (2.57) [1.0].

A Declaration of Policy

WESTERN DIVISION, AMERICAN MINING CONGRESS

Adopted at Salt Lake City, Utah, August 28-31, 1950

FOR the second time in a decade, the American system of freedom and dignity for the individual is being challenged by a ruthless foe.

The hour of decision is passed.

The time for action is here.

The mining industry, whose long tradition is one of peace and plowshares, must once again turn its eye toward the sword. More than a proud heritage is at stake here, more than a free economy. Our very soil is endangered.

Yet, despite the bitter fact that we must turn our efforts and our tools toward mobilization, we must not allow the essence of peace for which we may be fighting to be lost. We must continue to defend the rights of the people to govern their own future, to resist the creeping tentacles that a socialistic philosophy extends in a state of emergency. The right to choose our own economic future, within the limits of our individual abilities, whether as self-employed, as job makers or job seekers, is one of the precious attributes of our way of life. It is what gives reality and substance to a system of free enterprise and makes it one of our great human values.

We of the mining industry must continue, through example, to prove the vitality and unceasing importance of personal initiative, self-reliance, industry and thrift—as opposed to the "something for nothing" philosophy which so tenaciously clings to our economy in the wake of war.

Our duty, however, is clear and the members of the mining industry here assembled pledge to our government full and complete cooperation, both directly and in the carrying out of the obligations we have assumed under the United Nations charter. The rights of free peoples must be protected and the position of our nation as a leader of free nations must be maintained. Whatever our industry, individually or collectively, can do to make these objectives certain, we pledge without reservation.

To enable the mining industry to produce the metals and minerals necessary for the running of the war we urge adoption of the following policies:

MANPOWER

The mining industry pledges utmost cooperation to the rearming of the country in this time of national crisis. In order to achieve the maximum productivity it is essential that the Federal Government remove existing hindrances and avoid the imposition of additional ones preventing the full use of the potential capability of the industry to produce. We learned from experience in World War II that the mining industry must be protected from the loss of skilled and experienced manpower. We recommend immediate steps to defer the drafting or calling for active duty of miners, millmen, smeltermen, refiners, and other workers essential to the metals and minerals industry. We further recommend the establishment of an employment stabilization plan forbidding the pirating of manpower from this industry.

The most recent governmental statistics show that the national working force is employed slightly less than an average of forty hours per week. A tremendous reservoir of manhours can be made available by an appropriate increase in the length of the workweek, sufficient to release the men needed by the military forces and for the reactivation of defense plants, without depleting the working forces in essential industries. Congress established the standard workweek of forty hours in the Fair Labor Standards Act in order to alleviate unemployment during a time of depression. The reverse of that situation now prevails, and if this nation is to successfully cope with untiring Communistic efforts to destroy our way of life, we must utilize all of our resources, including the manpower available to us. To this end restrictive legislation, enacted during depression years for the purpose of spreading work, must be reviewed. We recommend that Congress immediately begin the lengthening of the standard workweek in order to keep the national working force in gear with the increasing volume of tasks to be performed.

The war against Communism must be prosecuted at home as well as abroad. Communistic control or influence in unions must be completely stamped out. Adequate measures should be provided to cope with sabotage and labor strife which the Communists in our working forces are prepared to foment. We recommend that specific legislation be provided for swift action and severe criminal penalties in all cases of industrial sabotage or espionage. We further recommend that it be made a Federal criminal offense for either labor or management to engage in violence in connection with a labor dispute.

Essential industries in this country should not again be paralyzed by monopolistic labor practices in this time of national crisis. To this end labor unions should again be made subject to the anti-trust laws of the United States.

The original concept in 1913 of a Department of Labor as an advocate of labor only is no longer logical or necessary. The Department is being improperly called upon to administer many laws affecting management and the public, as well as

labor. The trend of recent government reorganization plans in this respect now makes urgent that the Department of Labor be abolished and a new Department of Employer-Employee Relations be created in its place to administer, through the tri-partite control of labor, management and consumer, national policies pertaining to employers and employees in a fair and impartial manner for the public welfare.

We continue to maintain our previously expressed position with respect to the strengthening of our laws governing the employer-employee relationship.

GOVERNMENT EXPENDITURES

The Government must meet the needs of the present emergency adequately and efficiently, honestly and fairly, and without waste or extravagance. Activities and projects, even if justifiable in normal times or as normal functions, must be curtailed, deferred or eliminated, if not absolutely essential in the emergency. Only by strict application of these criteria to existing or new authorizations, whether by legislative or administrative action, can the needs of the emergency be met satisfactorily, inflation minimized, and an intolerable tax burden avoided.

TAXATION

Adequate revenues must be raised by taxation to meet the needs of the present emergency. In imposing new and increased taxes, the Government should be scrupulous to see that these are not so severe that they destroy the system of private enterprise which we are striving to preserve. Tax laws and their administration must be fair and equitable, and particularly in time of emergency must not penalize resourcefulness, efficiency and economy in achieving maximum production at minimum cost.

Any excess profits tax imposed for the emergency should apply only to profits that are truly in excess of normal profits. Adequate credits for invested capital and for normal earnings should be allowed, with effective provisions for relief where merited. The extreme difficulties of determining what may be considered excess profits in mining must be fully recognized. The credit for normal earnings should be fairly determined with due allowance for normal growth, for abnormalities, for the special problems of new mines, and the high risks and peculiar nature of all mining as a wasting asset industry wherein no two enterprises are wholly comparable. Because of the speculative nature of mining, invested capital in many mining enterprises does not provide an adequate basis for determining either normal or excess profits. Only such income of mines as results from unit profits in excess of normal unit profits can be considered as real excess profits, regardless of the volume of production. Income taxes should be deductible in any determination of income subject to excess profits tax. The production of strategic minerals should not be subject to an excess profits tax.

Recommendations we have made in prior years, as necessary for the fair taxation of mine income, are no less essential for such taxation at the higher rates of the emergency period. We specifically commend and urge prompt enactment of the following recommendations of the National Minerals Advisory Council:

1. Development costs after discovery should be recognized as operating expenses.
2. Losses from unprofitable ventures should be allowed to corporations, partnerships or individuals as ordinary deductions against current income.
3. Income should not be taxed without full allowance for losses of loss years.
4. Adequate allowances for percentage depletion should be made.
5. Allowance for depletion should be made to the stockholder as well as to the corporation.
6. Tax exemption should be granted to a mine for a period of at least three years after beginning of profitable operations. A similar provision in Canadian law has provided a powerful stimulus to development of new mines in Canada.

We believe that tax laws based on the recommendations we have made will deal fairly with taxpayers and, over a period of time, will yield substantial increases in government revenue, not only from a more vigorous and prosperous mining industry, but also from the numerous individual and other taxpayers who will prosper with it.

Production of mineral raw materials should continue to be exempt from renegotiation of Government contracts or subcontracts, as it has been heretofore.

TARIFFS

Metals and minerals are indispensable to our national defense and security. Ore reserves in foreign countries cannot be depended upon to meet the emergencies of an atomic age and the hazards of air and submarine warfare, however important such reserves may be to supplement our domestic production in specific instances in times of peace.

We recommend therefore that Congress exercise its constitutional responsibility over tariffs through the Tariff Commission, to be administered for the welfare of the American people with strict accountability to the Congress. Reasonable protection should be provided against unfair competition from cheap foreign wages and depreciated currencies, in order to encourage exploration and development for new ore deposits and to maintain employment for American workers.

We oppose inter-governmental commodity agreements and cartels that call for state control over industry, or involve the regulation of production and prices in conflict with the traditional principles of Western civilization.

STOCKPILES

National security requires producing mines, mills and smelters, with experienced working forces. Our real and fundamental defense is the strength and productive capacity of our industries.

We approve the building up and maintenance of stockpiles of metals and minerals essential for national defense. But except under critical con-

ditions we believe that the best time to build up stockpiles is when output exceeds demand.

We recommend the maintenance of sources of production of strategic and critical metals and minerals within the United States. Production of these vital resources is being eliminated.

We favor consideration of the problems of the strategic metals and minerals separately from those of the essential and critical metals and minerals. A national policy regarding strategic metals and minerals must be adopted promptly lest production of these vital materials cease within the United States.

INCENTIVES

Tariff reductions, high costs, heavy taxes and unstable metal prices have discouraged mine development during recent years. During World War II manpower shortages and emphasis on production left no opportunity to maintain or extend ore reserves, and some reserves were depleted without adequate returns.

We recommend the establishment of a sound national mineral policy that will furnish an incentive for prospecting, exploration and the development of mines producing essential minerals. We recommend in the interest of national security that the Government afford to domestic mines at least the same consideration and assistance it gives to foreign properties.

The search for new ore deposits by individuals and small companies has been blocked by excessive taxes. A constructive tax policy is needed to further the development of our mineral wealth. We urge tax revision that will make venture capital available to the speculative endeavor of prospecting and the development of new mines.

FINANCING OF PRIMARY MINING VENTURES

We recommend further modification in the regulations of S. E. C. to facilitate public financing of primary mines and that Government loans be made available when public and private financing are not available for mine development.

PUBLIC LAND POLICY

A group of seven amendments to the United States Mining Laws have recently been proposed for the ostensible purpose of facilitating mining development on Government lands, eliminating interference with other desirable uses of Government lands and preventing their unauthorized use in the guise of mining locations.

After careful study, we conclude that the suggested amendments would not accomplish their alleged purpose; that they would set up additional requirements for locating and maintaining mining claims in good standing, and that they would deprive a locator of rights which he now acquires that are necessary for the development of our mineral resources. Therefore, the American Mining Congress opposes each of the suggested amendments.

Our mining laws were designed to encourage the discovery and development of the mineral resources of the country by private citizens with private capital. They have not retarded the development of these resources. Under them, the United States has become the world's greatest producer of metals and minerals. On two occasions within the last thirty-five years, availability of these resources made it possible for us to produce the sinews of war necessary to protect our national existence.

This is not the time to be concerning ourselves with amendments to established laws. We should be directing all of our efforts toward increasing the production of metals and minerals. The Government bureaus should be concerning themselves with the same objective and should set their vast personnel to work on a constructive program that will facilitate its realization within the framework of the present laws.

In the administration of existing laws there is need for more cooperation in accomplishing their objectives. This requires an appreciation of the practical problems of the mine locator and operator free from any concept that there is something wrong with private acquisition of a valid and bona fide mining claim.

This cooperation by the Government could be most effectively made:

1. By accelerating the issuance of mineral patents which would make the financing of new mine ventures much easier.

2. By liberalizing the rulings as to what constitutes an adequate discovery of minerals, particularly in cases where low metal prices make immediate development undesirable.

3. By placing in appropriate positions in the Forest Service administration officials who are qualified to pass on valid mineral discoveries and who are sympathetic with the bona fide development of minerals in the Forest Reserves.

SOCIAL SECURITY

We must continue to resist the type of "Social Security" program which not only undermines personal ambition and desire to work, but endangers our free economy and our free enterprise system as well. We do not believe in a social welfare state.

We note with pleasure that the definition of "employee" as adopted in Public Law 734, 81st Congress, follows in general the common law criteria for determining employee-employer relationship. We adhere to the language of the Gearhart Resolution, adopted in 1948, as being a fair and adequate definition of the employment relationship.

We view with concern in the light of the present emergency, Social Security commitments being made by our government, which may endanger the solvency of the fund from which Social Security benefits are payable.

We cannot support the kind of unemployment benefit payments which lull the employee away from dependence upon himself for economic support under the guise of federal protection of his earning power.

We oppose health insurance and medical care by compulsion, or any system of socialized medicine controlled by national bureaucracy.

GOLD AND MONETARY POLICY

Preservation of monetary stability against the avowed intent of our Communist enemies to de-

base currencies is of particular concern in this time of danger. Unrestrained deficit financing, which is invited by a currency not backed by gold and silver, plays into the hands of our shrewd opponents no less disastrously than blunders on the diplomatic front. To check the threat that mounting inflation creates for the system we are doing our utmost to defend, the restoration of gold to its historic monetary function is essential. Unless this is done and the discipline of gold restored, excessive government borrowing is likely to continue to be the principal means of meeting the acute financial demands for defense, with dishonest avoidance of ultimate obligations through inflation with its train of suffering and precisely that economic dislocation sought by our enemies.

A free market for gold for a limited period we still regard as the best means of determining a realistic ratio at which interchangeability of gold and the dollar can be established and thereafter maintained. Under existing emergency conditions, however, we recognize that time might not permit this logical procedure. Consequently, to avoid the dangers to our economy of further delay, we urge the prompt restoration of a true gold standard with free circulation of gold and with the gold content of the dollar fixed at an amount determined by a monetary commission composed of men of recognized competence.

SILVER POLICY

We endorse the existing Federal policy with regard to the acquisition of silver for its beneficial influence upon the base-metal mining industry, as well as for its traditional service in providing a base for a portion of the nation's currency.

GOVERNMENT REORGANIZATION

The objectives of the Hoover Commission study of Federal Government reorganization should be given full support by all members of the industry. At a time when our efforts are devoted to strengthening the national defense, the reduction of unnecessary expense in the Departments of the Federal Government would go far in meeting the vast increase in costs of military mobilization, stockpiling and other essential activities. The responsibility for good government belongs to all of us, and it is a matter of vital necessity that we devote our efforts to strengthening the economy in the period ahead.

We oppose the transfer of the Bureau of Land Management to the Department of Agriculture. We also oppose the creation of a Columbia Valley Administration and other new agencies of this type.

BUREAU OF MINES—GEOLOGICAL SURVEY

The United States Geological Survey and the Bureau of Mines perform technical services of vital importance to the nation and to the mining industry. We have the utmost confidence in the extremely able engineers who direct these important Government agencies.

The expense of maintaining these two agencies is a relatively small item of the total cost of the Federal Government, and we urge that the necessary appropriations be made to continue their activities so essential to the mining industry.

We commend the excellent safety education program of the Bureau of Mines. This program has gone far in promoting safety-consciousness throughout the mining industry and in conserving the manpower so necessary to production. We recognize the extreme importance of safety in our operations and urge that the Bureau of Mines be given adequate personnel to continue this program.

We oppose enactment of pending legislation which would give police powers to the Bureau's coal mine inspectors, under which the Bureau would become a means for further Federal encroachment on the rights of the States.

MINERALS ADVISORY COUNCIL

We endorse the action of the Secretary of the Interior in creating the National Minerals Advisory Council. We urge that the advice and counsel of this group be sought, fully considered, and acted upon by Government agencies in formulating national mineral policy during the defense mobilization period ahead.

WATER POLLUTION

We reiterate our past position that water pollution is a local problem, the nature and extent of which varies in each locality, and we urge that Federal concern with this problem be limited to furnishing scientific aid, engineering studies and loans in aid to State or local governments.

LAND USE

We view with disapproval any legislation to compel restoration of the surface of lands mined by stripping or dredging which would hamper orderly extraction of metals or mineral products and place unwarranted economic burdens upon the mine operator.

FREE ENTERPRISE

Even though all we hold dear personally may eventually be at stake, we must not lose sight of the fact that our enemies from without are bent primarily upon the destruction of all free competitive enterprise systems. Ours, which we of the mining industry have helped build and which has, in turn, helped us prosper, is their main target.

In fighting this enemy from without our borders, we must be vigilant to resist the type of slow strangulation that comes from within in the form of controls which may be unnecessary now, and controls which may be continued under false guise when hostilities cease.

We must continue to champion those who believe in the time-tested philosophy of "rolling up the sleeves" of a shirt purchased through personal initiative and good hard work. This is the foundation upon which has been built a way of life which half the world today is envying and trying to emulate and which the other half is trying to destroy.

Let not the deadly parasites of economic controls fasten themselves on our body politic and destroy the very things we seek to save.

Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

CONGRESS swept through major legislation and recessed on September 23 to go home for the political campaigns. The legislators will return for the third and last session of the 81st Congress on November 27 and will give top priority to consideration of an excess profits tax measure and bills providing statehood for Alaska and Hawaii. All measures pending at the beginning of the current recess retain their same position on the calendars or in committees.

The striking successes of U. N. forces in Korea have not brought any lull in the nation's rearmament program and the Administration is stepping up the building of a military machine with increased economic controls evidently in prospect.

Taxation

President Truman signed the $4¾ billion interim tax bill on the same day that Congress departed for the hustings. Conferences between the House and Senate resulted in the adoption of a compromise measure which raised corporate tax rates for 1950 to a 23 percent normal tax on all income and a 19 percent surtax on income in excess of $25,000. For 1951 and subsequent years the normal rate will be 25 percent with a 20 percent surtax on income in excess of $25,000. Individual income tax withholding was increased from 15-18 percent, effective the first of this month.

The new law also provides: (1) a one-year carry-back and five-year carry-forward of net operating losses; (2) acceleration of the payment of corporate taxes—the so-called Mills plan; (3) that capital costs of certified defense plants may be amortized over a five-year period; and (4) that capital gains rates no longer apply to income upon liquidation and distribution of assets of so-called "collapsible corporations."

Several proposals made by the House or Senate *are not* a part of the law. These include: (1) the House-approved increase in the percentage depletion allowance for coal from 5-10 percent, and the addition of a number of new minerals to receive percentage depletion; (2) the House-approved amendment under which losses on abandonment or sale of capital assets or property used in the trade or business would be deductible only against capital gains; (3) the House-approved 10 percent withholding tax on corporate dividends; (4) the House-approved plan to tax pre-1913 earnings; (5) the Senate-approved amendment which provided that where a person owns an economic interest in oil, gas, or minerals and sells the right to take oil, gas or minerals produced from such property until a specified quantity has been obtained, the proceeds he receives from such assignment shall be treated as proceeds from the sale or exchange of a capital asset.

An amendment urged by the American Mining Congress, providing that costs of transporting ore, coal or other minerals to the mill or preparation plant be included in "gross income from the property" in computing percentage depletion, was adopted by the conferees, with a limitation of such transportation to 50 miles except as a greater distance may be found by the Treasury to be necessary.

In order to speed the tax bill into law, Congress decided not to write an excess profits tax into the measure but voted to consider such proposals at its next session. House Ways and Means Committee Chairman Doughton (Dem. N.C.) immediately scheduled hearings on an excess profits tax for November 15.

Economic Controls

President Truman signed the Defense Production Act of 1950 on September 8 and then placed the machinery provided in the new law into gear by issuing executive orders directing industry to preserve their price and cost records and delegating powers to existing Government agencies.

To the Commerce Department went powers to allocate materials, to requisition, to establish priorities, and to control inventories over-all commodities, except fuels, gas, power, food and transportation. This Department created a National Production Authority, headed by William Henry Harrison, which might well become the nucleus of a War Production Board should the international situation become more acute. The Interior Department was singled out to handle the economic controls over power, petroleum, gas and solid fuels. To the Interstate Commerce Commission went authority over all domestic transportation, and to the Agriculture Department went controls over agriculture, domestic distribution of farm equipment and fertilizer. NSRB Chairman W. Stuart Symington was designated as the coordinator of the control program.

Under terms of the Presidential order and through later agreements the Interior Department is the claimant agency for fuels, petroleum, power, metals and minerals, and for the mining industry's requirements for machinery and supplies. As such it will be responsible for championing the mining industries' case in obtaining allocations or priorities on materials in short supply, both for maintenance, repair and operating supplies for the mines and for the manufacture of mining equipment.

To handle these powers the Interior Department established a Minerals and Energy Administration with Sec-

Washington Highlights

CONGRESS: In recess till Nov. 27.

TAX: Excess profits tax in offing.

CONTROLS: Being clamped on gradually.

STOCKPILING: New Munitions Board Policy.

SCRAP DUTY: Import Duty Suspended.

NLRB: Under Investigation.

MANPOWER: Mining's needs studied.

retary Chapman as Administrator and four assistant administrators charged with minerals, power, solid fuels, and petroleum and gas. Bureau of Mines Director James Boyd was named temporary administrator of the minerals agency. Dan Wheeler was appointed temporary director of the Solid Fuels Agency and will be assisted by George Lamb of the Pittsburgh Consolidation Coal Co.

Under the terms of the Executive Order delegating the powers conferred in the Defense Production Act, the Defense, Commerce, and Interior Departments, the Reconstruction Finance Corporation, and the General Services Administration will have the responsibility of increasing productive capacity and supply, by means of loans, advance contracts and other financial measures. As to minerals and metals in this connection, the order provides: (1) the RFC is authorized to make loans to private industry for expansion of capacity, development of technological processes, and production of essential materials, including "the exploration, development, and mining of strategic and critical metals and minerals"; (2) the General Services Administration is directed to purchase or make commitments to purchase metals, minerals and other raw minerals, including liquid fuels for Government use or resale; and (3) the Secretary of Interior is directed to encourage the exploration, development, and mining of critical and strategic minerals and metals.

The order also created a new and independent Economic Stabilization Agency, which will administer price and wage stabilization when necessary. Dr. Alan Valentine, Rochester, N. Y., businessman and educator, has been named to head this agency.

Representatives of steel, copper, zinc, sulphur and other key raw materials industries have been meeting with Commerce Secretary Sawyer and NPA Administrator Harrison to look into the supply-demand situations in each industry, and to lay plans for any possible allocation programs that may be required to meet defense needs.

Priority Ratings

The military and the Atomic Energy Commission have been given authority to issue "Defense Order" or "DO" priority ratings, which mean that all those contracting with the Government for direct defense needs must give first preference to such orders and may obtain required materials for production through extension of the priority rating to their suppliers.

The NPA has also issued a broad inventory control order over 32 basic commodities. Under terms of the order, which applies to everyone but "ultimate consumers buying for personal or household use," producers will be required to limit their stocks of the controlled materials to a "practicable minimum working inventory."

The controlled materials include building materials, chemicals, forest products, iron and steel, certain metals and minerals, rubber, and a few textiles. Metals and minerals placed under inventory control are: aluminum, columbium, cobalt, copper, magnesium, manganese, nickel, tin, tungsten, zinc, and nonferrous scrap. Building materials include Portland cement, while chemicals include caustic soda and soda ash. Mine ties are specifically excluded from control.

Certain transportation controls designed to provide more efficient use of freight cars were also instituted. These included (1) a direction to the railroads to increase sharply their demurrage charges; (2) an order to the railroads to get their cars moving faster after they are loaded or unloaded, and (3) prohibition of the use of freight cars to move commodities between points in a single city or between cities adjacent to each other except where there is no other common carrier capable of carrying the shipment or where motor vehicles are not available to move the goods. These orders became effective September 20 and will continue until April 1, 1951.

Stockpiling

The Munitions Board has revised its purchase policy for the defense stockpile to permit payments above going market prices to domestic producers in special cases where necessary to stimulate production of highly essential and scarce materials.

The new policy authorizes payment in excess of 25 percent over the foreign price for domestic materials urgently needed for national security in cases where the U. S. does not normally sell in the world market. This action removes the former limit of 25 percent above foreign price which could be paid to domestic producers unable to compete with foreign goods.

This policy is to be applied in its strict sense, and will be used only where national security needs dictate its use, according to the Munitions Board. It will not be used as a general subsidy measure in any sense, the Board said.

Meanwhile, the President has approved a $16.7 billion supplemental appropriation bill which carries $598,000,000 for stockpiling strategic and critical materials.

Export Controls

The Commerce Department has strengthened expert controls over all nonferrous metals to conserve U. S. supplies. Export licenses are now required for all foreign destinations except Canada.

Since early in September the Department has refused to approve any export licenses for copper, lead, zinc, and aluminum as a preliminary move towards establishing quotas for the fourth quarter. Such quotas have now been set and applications for export licenses can again be made.

Scrap Import Duty

In one of its last actions before recessing, Congress passed and sent to the White House H.R. 5327, suspending import duties on metal scrap until June 30, 1951.

No effort was made by proponents of a copper import tax suspension to tack such an amendment on the bill. Senator McMahon (Dem., Conn.) paved the way for Senate passage of the scrap bill when he announced he would not press his fight for the copper duty suspension to the point of endangering enactment of the scrap bill.

McMahon did emphasize that he will seek Senate passage of a copper import tax suspension bill when Congress reconvenes.

NLRB Investigation

The Senate Labor subcommittee on labor-management relations will undertake an investigation of the National Labor Relations Board, with hearings likely to begin shortly.

Senator Wayne Morse (Rep., Oreg.) requested the investigation in order to determine what might be wrong in the General Counsel's office and what difficulties are being met in administering the Taft-Hartley Act. He told reporters that he is "not entirely convinced that the chairman's office is being run as efficiently as it might be." The resignation of Robert Denham as General Counsel and charges that the NLRB is a "two-headed agency" and therefore "unworkable" brought on the probe.

The House Labor Committee will not undertake a similar investigation.

Manpower

Secretary of Labor Tobin has established a joint committee on essential activities and critical occupations. This committee will review the lists of essential activities and critical occupations issued early in August and advise the Secretaries of Labor and Defense regarding necessary changes.

The committee will also study and make recommendations to the two Secretaries with respect to industry and governmental requests for revisions and modifications needed in the two lists to meet the requirements of national defense and the needs of the civilian economy. Currently the lists of essential activities and critical occupations are being used by the De-

(Continued on page 105)

AMC Personals

Dr. C. E. Lawall, chairman, mining development committee, Bituminous Coal Research, Inc., has announced the appointment of **Frank White** and **August J. Breitenstein** to the program's

Frank White

A. J. Breitenstein

mining advisory group. Mr. White is vice-president in charge of operations, Peabody Coal Co., and Mr. Breitenstein is assistant to the president in charge of engineering, H. C. Frick Coke Co. and the U. S. Coal & Coke Co.

Walter E. Herkenhoff has been named assistant mine superintendent at the Chino mines division of Kennecott Copper Corp. **W. Howard Winn** has been appointed assistant to the smelting superintendent. **Rex Mathews** has been named chief electrician to succeed **Dan G. Thorne,** who has been promoted to general maintenance foreman. **Kenneth V. N. Harris** has been named general mine foreman at the Santa Rita pit. **Abe P. Morris** has been appointed assistant to general manager **R. W. Thomas** at Ray, Ariz.

Arthur J. Blair, chief geologist for the Tennessee Coal, Iron and Railroad Co. and connected with the company since 1909, has announced his retirement. He is opening an office as consulting and mining geologist in Birmingham. Prior to joining the staff of the Tennessee Coal, Iron and Railroad Co., Mr. Blair was employed by the E. J. Longyear Co. following his graduation from Northwestern University.

Charles N. Bailey has succeeded **Ford E. Boyd** as chief engineer of the Oliver Iron Mining Co.

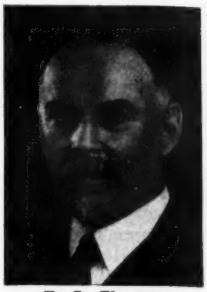
Dr. E. W. Volkmann and **Dr. F. L. Jones** have been appointed assistant managers of the research department of Koppers Co., Inc., according to an announcement by **Dr. G. F. D'Alelio,** vice-president and manager of the research department.

Benno L. Elkan, chairman of the National Zinc Co., a subsidiary of International Minerals & Metals Corp., has retired as chairman of the latter corporation.

Thomas G. Fear has joined the engineering department of Clinchfield Coal Corp., Dante, Va.

Dr. Francis A. Thomson, president of the Montana School of Mines for the past 22 years, has resigned from that post because of poor health. He received his appointment to the post on July 1, 1928. Dr. Thomson has been advised by his physician to seek lower altitude and complete rest. Montana's State Board of Education has appointed **A. E. Adami,** school vice-president and dean, as acting president, effective September 15.

Dr. Thomson has had a long and varied career in mining. Born in London, England, December 21, 1879, he was raised in British Columbia, and first entered the mining field as a prospector, miner and assayer. He graduated from Colorado School of Mines in 1904 with an E.M. degree, and later attended the Royal School of Mines in London and the Ecole des Mines in Paris. On returning to America he went into consulting and operating work in Colorado and Nevada. In 1908 he became head of the department of mining engineering at the State College of Washington at Pullman, and was acting dean in 1913-14. He resigned to become dean of the School of Mines at the University of Idaho, serving there until his appointment as president of Montana School of Mines. Colorado School of Mines conferred the degree of Doctor of Science on him in 1923.



F. A. Thomson

Fox Named Editor of Mining Congress Journal

JOHN C. FOX

JOHN C. FOX has been named editor of "Mining Congress Journal" to succeed Sheldon P. Wimpfen, who has resigned to join the Raw Materials Operations of the Atomic Energy Commission, where he will be engaged in special problems of uranium production.

Mr. Fox brings to the Journal the benefits of broad experience in mining and technical writing. He worked as sampler and surveyor in a Nevada gold mine; as draftsman and engineer for Chile Exploration Co.; in the New Jersey mines of New Jersey Zinc Co., first as a miner and later as engineer; at the Bertha Mineral Division lead-zinc mines in Virginia, as engineer; and with the Nicaro Nickel Co. in Cuba, first as engineer in charge of stripping operations, later as office and cost engineer. Extensive knowledge of underground and strip mining of bituminous and anthracite coal was gained as a technical representative in the explosives field, and during this period he also became well versed in the mining and quarrying of limestone and sandstone.

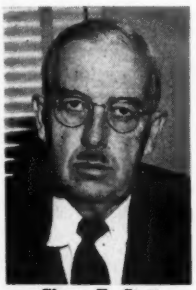
More recently he taught all phases of mining engineering at the School of Mines of Columbia University, of which he is a graduate. He also did mine consulting work, wrote for American Metal Market and was the author of the "New York Letter" of the Canadian Mining Journal.

Robert N. McIndoo has been appointed assistant master mechanic for the Canisteo district of the Oliver Iron Mining Co. **W. J. McGuire** has been promoted to general track foreman at the Hull-Rust mine. He succeeds **T. J. Boyle**, who has been transferred to the Sherman mine as general track foreman.

D. C. Stewart, former chief clerk for the Coal Division's operating vice-president, has been named coal division industrial relations manager for Eastern Gas & Fuel Associates.

Roy E. O'Brien has been named western secretary of the American Institute of Mining and Metallurgical Engineers. His long experience throughout the western states will be a distinct advantage in his new position. Mr. O'Brien was recently with Mountain Copper Co., Rio Tinto, Nev., and had been employed by International Smelting & Refining Co. and by the Anaconda Copper Mining Co.

Charles E. Stott, deputy director, strategic materials division, Economic Cooperation Administration, has been named director to succeed **C. H. Burgess**, who has resigned to become treasurer of the United Electric Coal Cos. Mr. Stott, who has been with the strategic minerals division since February 1949, was in the continuous employ of the American Metal Co., Ltd., for over 20 years in Mexico, Texas and New Mexico, including ten years as vice-president and general manager of the company's mining, milling and smelting operations in Mexico.



Chas. E. Stott

Karl A. E. Berg, who was assistant chief geologist for the Northern Pacific Railway since May 1949, has been named manager of iron ore properties of the Northern Pacific Railway and its subsidiaries in Minnesota, to succeed Carl Zapffe. Mr. Berg has been associated with Northern Pacific Railway since 1920.

W. A. Haslam, manager, Kentucky-Elkhorn division, Pond Creek Pocahontas Co., has announced the promotion of **Ralph C. Ison** from mine foreman to superintendent of No. 3 Elkhorn mine, located in Breathitt County, Ky. **Mack H. Shumate**, formerly special engineer at Island Creek Coal Co., has been named assistant to the manager. **Charles K. Tudor**, a recent graduate in mining engineering from the University of Kentucky, was appointed engineer-in-training.

—Obituaries—

Carl Zapffe died Monday, August 28, in a Brainerd, Minn., hospital after a brief illness. He had been manager of iron ore properties for the Northern Pacific Railway Co. until his retirement on May 1, 1950.

In 1905, Mr. Zapffe began his service on the Cuyuna iron range at the time the district was being explored. In 1908 he was appointed geologist for the Northern Pacific Railway Co. and in 1925 became manager of all iron ore properties.

He participated in many geologic surveys and studies in all states along the railroad's line as a researcher. He had done considerable on the liquidation of solid fuel.

JOSEPH STAGG LAWRENCE

AN APPRECIATION BY
DONALD H. MCLAUGHLIN

News of the death of Joseph Stagg Lawrence on August 25, 1950, was a harsh blow to his many friends in the mining world.

His outspoken and militant advocacy of intelligent conservatism was invigorating and inspiring. He had no use for the indirection and subterfuge so characteristic of the left wing. He had no less contempt for the cowardice of those of the opposition who were willing to compromise on fundamentals and who would not stand their ground in political or economic arguments.

Lawrence was born in Budapest, Austria-Hungary in 1896. He served for five years on the faculty of Princeton after his graduation from the college with Phi Beta Kappa and other honors in 1923. His studies in money and banking and his publications gained recognition not only among scholars in his special field but also among banking and buiness groups, where his skill in statement of problems and clarity of reasoning were widely appreciated. As vice-president of the Empire Trust Co., and member of Economic Policy Committee of the American Banking Association, as a fellow of the Brookings Institute, and as a director and adviser on many insurance and investment organizations, he had ample range to employ his notable talents to marked advantage.

We in the mining world, however, are especially grateful for the opportunity we have had to know him as a charming and lively companion as well as a thoughtful and earnest master of his field. The wise guidance he provided for our thinking on gold and monetary problems will not be forgotten, nor will the warm, friendly and rewarding association that we enjoyed with him.

Samuel A. Taylor, who was president of the American Mining Congress 1912-1913, passed away in Pittsburgh, Pa., August 20 at the age of 86.

Following his graduation with the degree of Civil Engineer from the University of Pittsburgh (formerly the Western University of Pennsylvania) in 1887, Mr. Taylor worked for the Carnegie Steel Co. and the Pennsylvania Railroad before opening offices in Pittsburgh as a civil and mining engineer.

Mr. Taylor as AMC president in 1912

He was a past president of the Coal Mining Institute of America and the Engineers' Society of Western Pennsylvania. On many occasions he served in consulting capacity to the U. S. Government and the Government of the Dominion of Canada.

Mr. Taylor was a member of many professional and learned societies including the American Institute of Mining & Metallurgical Engineers and the American Society of Civil Engineers.

F. J. Maple, retired advertising manager of the John A. Roebling's Sons Company, died in Duneden, Fla., in late August. Mr. Maple was well known in the mining field and was active in the work of the Manufacturers Division of the American Mining Congress, having served as Chairman in 1931.

Dr. M. F. Coolbaugh, 73, former president of the Colorado School of Mines, died September 9 in Denver, following a heart attack. He was president of the school from 1925 through 1946, when he became president emeritus. Since retirement he had been doing consulting metallurgical research.

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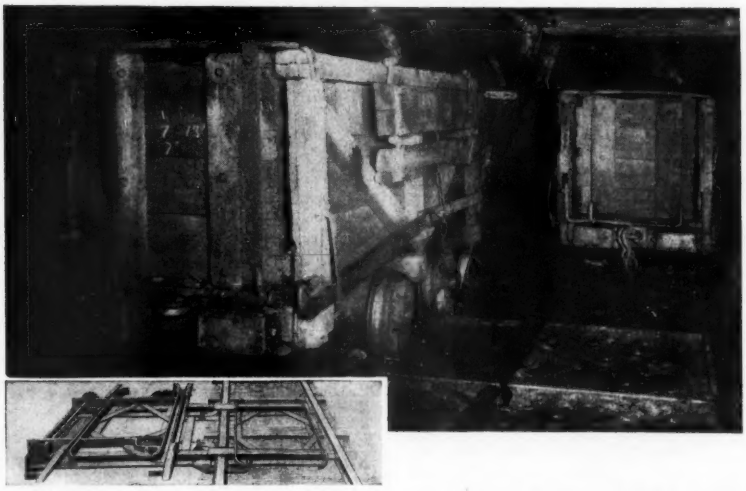

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Bituminous Coal Operators

On September 21, George H. Love, acting president of the newly organized Bituminous Coal Operators Association, announced that this organization, representing 153,000,000 tons of bituminous coal production, has been completed by the election of the board of directors and a president and a secretary-treasurer. Harry M. Moses, for the last 13 years president of the H. C. Frick Coke Co. and associated companies, was unanimously elected president. Joseph G. Chromis, who has been associated for the past 25 years with Mr. Moses as his personal secretary and administrative assistant, was elected secretary-treasurer.

The board of directors, consisting of the chief executives of member companies, are: Charles B. Baton, L. C. Campbell, E. L. Clair, W. H. Colvin, Jr., Charles Dorrance, Charles E. Dunlap, Benjamin F. Fairless, William W. Holloway, Arthur B. Homer, R. L. Ireland, Thomas S. Jamison, Jr., R. H. Knode, E. B. Leisenring, George H. Love, A. R. Matthews, J. L. Mauthe, Admiral Ben Moreell, C. J. Potter, Clarence B. Randall, J. P. Routh, H. G. Schmidt, W. P. Tams, Jr., J. William Wetter and Charles M. White.

The organization was activated on October 1, 1950, when Mr. Moses resigned from his present position to devote full time to his new duties. Headquarters of the Bituminous Coal Operators Association will be located in the World Center Bldg., at Sixteenth and K Sts., N. W., Washington, D. C., on or about November 1, 1950.

The purpose of the association is to conduct contract negotiations between the member companies and the representatives of their employes and to generally promote stable and harmonious relations in this field.

"Lift" Aids Man Movement

At the Sonman Slope mine of Eastern Gas & Fuel Associates at Portage, Pa., a ski tow has been installed to provide a mantrip for taking the men from the working level to the surface. Miners ride regular mantrips on the mine railroad from their working places, but the last 550 ft before they leave the mine is made on foot up a 25 percent slope. There the ski tow equipped with straps for the men to hold onto has taken a lot of the burden out of this 550 ft of climb.

BCR Fundamental Research Committee

A new Bituminous Coal Research Committee to anticipate technical needs and opportunities of BCR member companies and their customers and to help guide the coal industry's research program has been announced by Dr. A. A. Potter, president, BCR. This committee will advise BCR management on opportunities for industry progress through coal research and will keep the organization informed about developments beyond the scope of BCR activities.

Members of the committee are: George D. Creelman, director of research, The M. A. Hanna Co., chairman; Dr. H. J. Rose, vice-president and director of research, Bituminous Coal Research, Inc.; John I. Yellott, director of research, BCR Locomotive Development Committee; Gerald von Stroh, director of development, BCR Mining Development Committee; Dr. H. H. Lowry, director, Coal Research Laboratory, Carnegie Institute of Technology; Dr. H. H. Storch, chief, Synthetic Fuels Division, U. S. Bureau of Mines; Dr. H. S. Turner, research assistant, Pittsburgh Consolidation Coal Co. Ex-officio members are: Dr. A. A. Potter, BCR president; C. A. Reed, secretary of BCR; and E. R. Kaiser, BCR assistant director of research.

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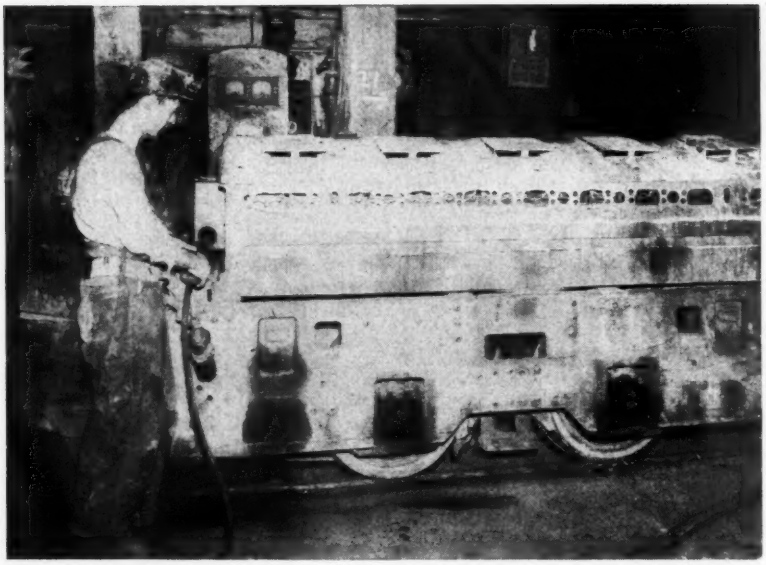

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Correction

In the July issue of MINING CONGRESS JOURNAL in the article "Elizabeth Mine Reorganized for Efficient Production" it was stated that "a new smelter was built in 1880 and operated until 1888 when the mine was shut down and the smelter was closed for good." In a recent letter, George A. Packard, mining engineer of Boston, tells us that he went to work at the old Elizabeth smelter in June 1890 on his graduation from Massachusetts Institute of Technology. Later on in the same year, as superintendent of the operation, he altered the blast pressure to produce a 45-48 percent copper matte. Copper prices were falling off and in December 1890 the management decided to close the smelter.

Virginia Lead-Zinc Mine

After a three-year diamond-drilling campaign the New Jersey Zinc Co. recently purchased a lead-zinc property at Ivanhoe, Va. Plans are now under consideration for sinking a shaft and further development.

Coal Production

Coal industry analysts estimate that 1950 production of bituminous coal will surpass 500,000,000 tons as compared with 435,000,000 tons in 1949. The anticipated increase in annual production is attributed to the rearmament program, the continuing high level of industrial production and the rise in heating oil prices. Electric utilities have maintained coal use at a rate above expectations and iron-making furnaces are demanding huge tonnages to support the increased rate of steel production.

During the first six months of 1950, bituminous coal consumption totaled 219,978,000 tons, according to tabulations made by Appalachian Coals, Inc. Bituminous coal used during the last six months of the year is estimated at about 241,390,000 tons, a total consumption for the year of 461,368,000 tons. Increases in coal stocks are estimated at 17,000,000 tons and the export tonnage is approximately 23,000,000 tons.

NJZ Readies New Shaft

Work is nearly finished on the new shaft at the Sterling mine of the New Jersey Zinc Co., Ogdensburg, N. J. The new shaft will be a complete replacement of the older one. When finished, the 8 by 30-ft five-compartment shaft will have two compartments for hoisting ore, two for handling men and materials, and one for a ladderway pipe and cable. Access openings connecting the ore body with the new shaft are nearing completion.

Annual Conference of the Coal Division

William Penn Hotel, Pittsburgh, Pa., Thursday, November 9, 1950

A CORDIAL invitation is extended to all coal operators and manufacturers interested in the improvement of coal mining to attend the 1950 Coal Division Conference at the William Penn Hotel in Pittsburgh, November 9. The conference will be for one day only, a morning session starting at 10 o'clock, a business luncheon and an afternoon session, concluding about 5 p. m.

This meeting will be an open forum where the committees will present their reports for discussion. The reports will be in preliminary form, but copies will be available so that all present may offer their comments and suggestions for further studies that will be of continued service to the industry.

Seven committees will report, covering studies now under way as shown in the following schedule:

Committee on Roof Action—Tests for roof bolting—Specifications for bolting materials—Economy of roof bolting.

Committee on Mechanical Loading—Projections for continuous mining plans—Maintenance training for supervisors.

Committee on Haulage Roads—Welded rail joints—Treated ties for main line and secondary haulage—Economy of tie plates.

Committee on Conveyor Haulage—Storage and handling of belts—Methods of belt conveyor loading—Inspection and maintenance of belting, conveyor structures and electrical equipment.

Committee on Underground Power—Cable insulation—Ground and circuit protection—Power conversion—Higher A. C. for face equipment—Mine illumination.

Committee on Surface Preparation—Sludge reclamation to recover fuel values and to prevent stream contamination.

Committee on Ventilation—Effect of roof bolting on the mine ventilating system.

Coal Preparation Tests

For the combined cleaning and dewatering of fine sizes of coal, experiments have been undertaken by the U. S. Bureau of Mines in cooperation with private industry and a new process has been brought closer to commercial application. Preliminary studies of the kerosene-flotation process capable of cleaning and dewatering smaller sizes of coal in a combined operation were first undertaken in 1947. To test the practicability of the process on a commercial scale, the Sloss-Sheffield Steel & Iron Co. constructed two plants at its Bessie and Kimberly mines in Alabama. Both plants are demonstrating that the process compares favorably with more conventional methods and virtually eliminate the sludge and slurry problems associated with wet methods of coal preparation. Other advantages of the process are that it greatly reduces the need for settling tanks in wet preparation plants handling raw-coal fines and that it permits greater recovery of coking-grade coal products which might otherwise be lost.

Frick Plans New Mine

On August 30, the H. C. Frick Coke Co., coal mining subsidiary of U. S. Steel, announced that it will open a new 4000-ton a day mine in Washington County, Pa. It was also announced that another mine of the same capacity, closed since 1928, will be reopened at Fayette County, Pa., to help meet the continuing demand for additional coal required to make more steel for national defense purposes.

The new mine will be developed between Vestaburg and Frederick. Plans include a river tipple for loading barges to carry coal down the Monongahela to the Carnegie-Illinois Steel Corp.'s by-product coke plant at Clairton.

Rehabilitation of the Collier mine near Uniontown, Pa., will assure a continued supply of coal for near-by beehive coke ovens. The Collier mine is expected to be ready for mining operations in about one year. The Washington County mine is scheduled to start producing early in 1952.

Dewatering of the Collier mine has been started in the first step toward its reopening and both surface and underground facilities will undergo complete changes.

Birmingham Research Lab

Sloss-Sheffield Steel & Iron Co. at Birmingham, Ala., is erecting the first unit of a proposed $500,000 laboratory project, the first unit costing about $100,000. Dr. William M. Lofton, Jr., is the company's research director.

Perlite Plant for Virginia

In Hopewell, Va., the Virginia Perlite Co. plans to install a perlite ore expanding plant with a capacity of approximately 20,000 4-cu-ft bags per month.

Crude ore will be obtained from the Great Lakes Carbon Corp., N. Y., one of the largest producers of perlite ore. Under an arrangement with that company, the Virginia Perlite Co. will sell processed perlite.

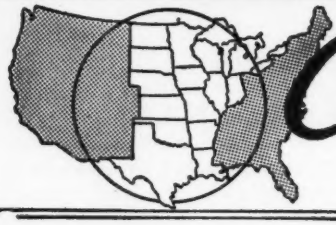
Nicaro Nickel May be Reactivated

A Munitions Board request has been placed before the Senate Appropriations Committee for $14,000,000. The request includes funds for the reactivation of magnesium and nickel plants including the Nicaro plant in Cuba, which is earmarked for $5,000,000. It is reported that several mining companies are interested in the Nicaro project which was operated during World War II by a subsidiary unit of the Freeport Sulphur Co.

Unique Ore Bridge

The Otis Works of the Jones & Laughlin Steel Corp. of Cleveland is to have the first 17-ton ore bridge to be powered by adjustable voltage d-c control instead of conventional constant potential d-c control.

This bridge will have a span of approximately 378 ft and an over-all length of 572 ft and will mount a 17-ton bucket. It will have a one minute operation cycle and will be able to handle 1020 tons of ore per hour. The unit will operate from a 4160-v, a-c supply through a motor generator set mounted on top of the bridge structure in the machinery house. Rototrol rotating regulators will provide the features of current-limited acceleration and deceleration for certain of the drives. These Rototrols are used to assure maximum performance of the equipment with minimum stress to the mechanical and structural equipment. Electrical equipment is being supplied by the Westinghouse Electric Corp. and construction by the Wellman Engineering Co.



Central States

South Agnew Dragline Move

Recently, at the Agnew mine of the M. A. Hanna Co., Hibbing, Minn., an 1150-B dragline, the portable screening plant, the stacker and the trailing conveyor truss were moved out to the Morton mine. Two sections were removed from the crude ore belt and the stacker and trailing conveyor were hauled by truck and tractor to the Morton mine. The dragline and screen plant were moved to the Morton property under their own power. When the equipment had passed through the opening in the crude ore conveyor, the sections were replaced and production resumed.

Homestake Installs New Crushing Equipment

Officials of the Homestake Mining Co., at Lead, S. D., have announced that work has been commenced at the Yates shaft in preparation for installation of a modern crushing plant which will materially increase milling efficiency. The stamp mills which have been a part of the company's milling operations for more than 70 years will be discarded. The new machine is a 30-in. jaw crusher capable of reducing 24-in. ore to 4½-in. size. It will replace gyratories which formerly crushed from 16 to 6 in., as well as the stamp mills.

Following discharge from the new machine, the ore will still go through a cone crusher and then a screening process. The coarse material from the screen will be recrushed in a second machine which reduces it to ½-in. size. The ½-in. material will continue to be further reduced in size by the present rod mills, and regrinding by ball and pebble mills. When improvements at Yates shaft are completed, the Ross plant will be modified in the same manner, and eventually the same changes will be made in the South mill.

Electrolytic Chromium

In an announcement made on August 17, the electro metallurgical division of the Union Carbide and Carbon Corp. stated that an electrolytic chromium plant will be constructed at Sault Ste. Marie, Mich. The plant is expected to be in operation in the spring of 1951 and will adjoin Union Carbide's extensive facilities there for the production of calcium carbide.

An entirely new process will be used, based upon developments of the U. S. Bureau of Mines. The metal produced is said to be of a higher degree of purity than any commerically produced chromium metal now available.

Steep Rail Rates

Speaking at a convention of the Railway Fuel and Traveling Engineers Association in Chicago, James Hyslop, president, Hanna Coal Co., a division of Pittsburgh Consolidation Coal Co., warned that rail transportation costs on coal are all out of keeping with economic reality and that they have created a condition which presses the coal and railroad industries with irreparable damage. He stressed the importance of transportation and its cost to coal in the competitive market and stated that car shortages have resulted in some mines working less than half time.

He mentioned the serious efforts in Ohio to promote a belt transportation project and pointed out that mine capacity has no significance unless coal can be moved to the point of consumption. At present there is an inadequate supply of open top cars, said Mr. Hyslop, and that the existing equipment is in a bad state of repair. This condition places coal at a great disadvantage before competing fuels, he emphasized, and coal cannot make deliveries on schedule.

He spoke of the new preparation plant in Harrison County, Ohio, which the Hanna Coal Co. expects to open about January 1. It will be one of the world's largest, with a capacity of 15 tons per hour of raw coal and 1275 tons of cleaned coal.

Illinois Mine Aid Examinations

A meeting of the Illinois mining board for examining candidates for certificates of competency as mine managers and other positions will be held in January, according to an announcement made by Walter Eadie, director of the department of mines and minerals. Announcement of the January meeting marks a new policy under which examinations will be held more frequently.

What happened at

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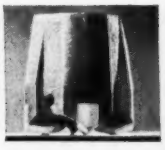

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Joint Taconite Development

Republic Steel Corp. and Armco Steel Corp. have joined forces in a $160,000,000 project for the production of iron ore from taconite in the Lake Superior mining region. The two companies have acquired, in equal shares, 100 percent ownership in the stock of Reserve Mining Co., which controls taconite deposits located at the eastern end of the Mesabi Range in Minnesota. The Reserve Mining Co. contemplates construction of a plant to process ore near Beaver Bay on the north shore of Lake Superior. The first unit, to be built as soon as plans can be completed, will produce about 2,500,000 tons of iron ore pellets annually. Taconite rock will be transported from the mines over a 47-mile railroad and loading facilities for Lake Ore carriers will be built.

The property under lease includes about 17,000 acres and the ore body is approximately nine miles long. It is said to contain 1,500,000,000 tons of magnetic taconite which can be mined by open pit method for conversion to about 500,000,000 tons of high grade iron ore, enough to supply 10,000,000 tons of ore annually for the next 50 years.

Geological studies indicate the presence of substantial additional tonnages. Longer range development programs call for plant expansion to provide 10,000,000 tons per year.

Dakota Lignite Yields Gas

During the 15th experimental run of the U. S. Bureau of Mines pilot plant at Grand Forks, N. Dak., more than 8,220,000 cu ft of potential industrial gas were produced from lignite. In conducting this test approximately 185 tons of lignite were gasified with about 45,000 cu ft of gas produced from each ton. The test was begun early in August and ran continuously for 802 hours gasifying 462 lb of lignite per hour.

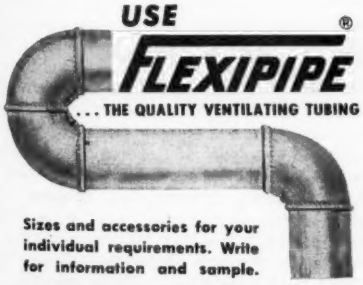
Commercialization of the gasification process might mean a new era of prosperity for the great Plains state, based on the extensive lignite reserves of North and South Dakota which, together, comprise 98 percent of the Nation's total lignite reserves.

The gas could be used in a variety of ways. By the addition of catalysts, such as cobalt and iron, synthetic liquid fuels could be produced. The gas could replace natural gas for heating purposes.

Bureau To Drill Iron Sulphide Deposits

A program of test drilling into deposits of pyrrhotite or iron sulphide is planned by the U. S. Bureau of Mines at Aitkin, Minn., it was recently announced. Plans call for drilling from 4-26 holes on the chosen sites.

Purpose of the drilling program will be to determine if there is sufficient pyrrhotite to justify full development. If suitable for commercial development, the ore could be economically mined through a stripping and open pit operation. Drilling will take from three to six months and the holes will be driven down about 200 ft. The bureau is seeking to develop inland deposits of sulphur to supplement present sources in Texas and Louisiana. Magnetic tests were used in determining the drilling area.



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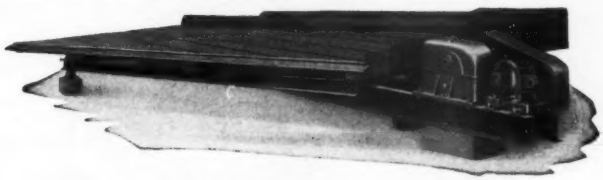

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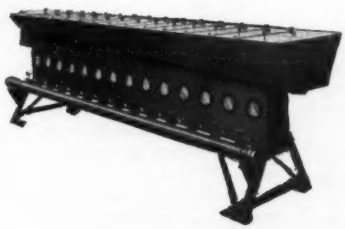

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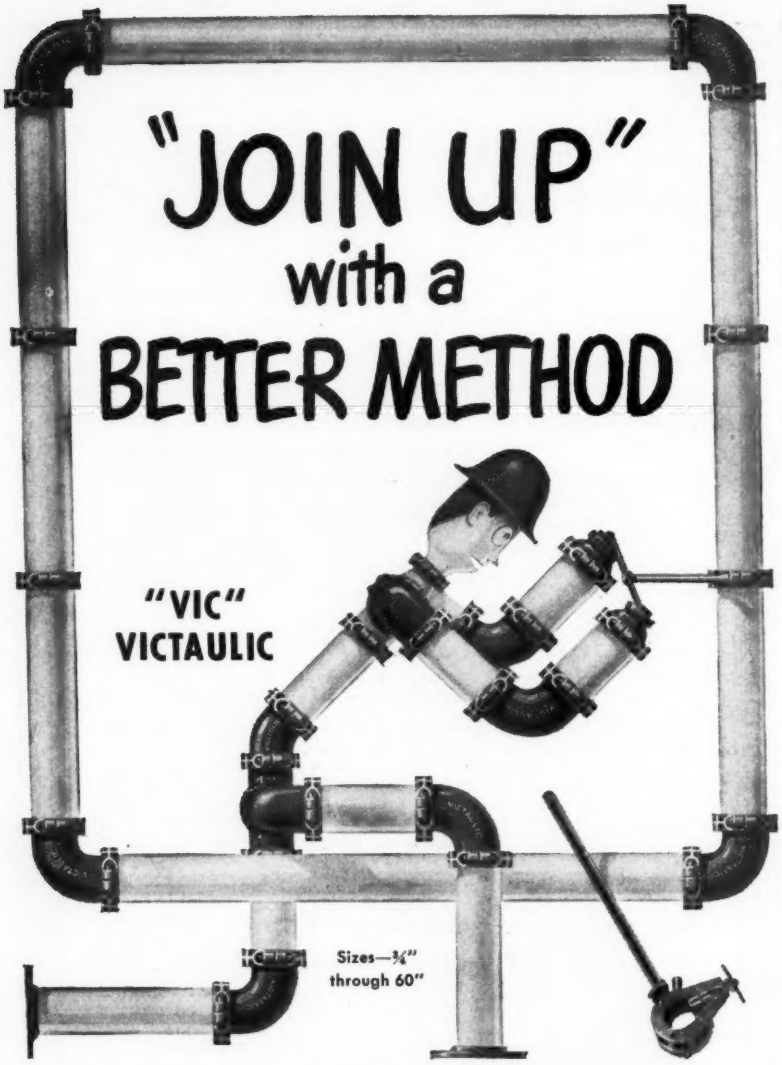

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The Pittsburg and Midway Coal Mining Co., operating in Kansas, boasts a replica of a huge power shovel modelled on the scale of one inch equals one foot. The detailed model may be propelled like its huge brother and can perform all the operations of the full size stripping shovel that handles a 34-cu yd dipper.

A veteran Kansas shovel operator constructed the shovel in his spare time over a period of 11 years. Approximately 30,000 rivets and 2000 bolts were used in building the minature shovel which has a total weight of approximately 600 lb as compared with its 2,520,000 lb original.

Wauseca Mine Extends Shaft

At the Wauseca mine of the M. A. Hanna Co. in Minnesota, the shaft is being extended to open the ninth level for production. The 8 by 18-ft shaft will be sunk 207 ft to the ninth level. An additional 99 ft will be required to provide room for a pocket and crusher. A ⅜-cu yd clam hydraulically operated is being used for muck removal from the shaft.

Mine Explosion Probed

An ignition of coal dust by unconfined shots of nonpermissible explosive caused an explosion at the Princeton Mining Co.'s Kings mine at Princeton, Ind., according to a recent U. S. Bureau of Mines report. Two coal miners lost their lives in the explosion, which could have been prevented, according to the Bureau report, by full conformance with provisions of the Federal mine safety code.

To prevent or minimize coal dust explosions under similar conditions, the report offered the following recommendations: unconfined shots should not be permitted in any coal mine; blasting shots should be properly stemmed and fired with a permissible blasting unit; when rock is so thick as to make breaking with a hammer impractical, it should be drilled and then blasted with a permissible explosive, permissible blasting device or compressed air; shots should not be fired from any power line unless fired from the surface with all men, including the shot firers, out of the mine; rock dust should be applied and maintained in all open workings to a point inby the last open crosscut next the face in every working place, in such quantity, that the incombustible content will be at least 65 percent plus one percent for each 0.1 percent methane in any ventilating current; coal containing fine coal dust should not be permitted to accumulate; where mining operations raise an excessive amount of dust, water or water with a wetting agent, should be used to allay the dust at its source.

Wheels of Government

(*Continued from page 95*)

fense Department in considering deferments for reservists and National guardsmen.

The committee is composed of representatives of Government departments and individual agencies. Its membership includes: Arthur W. Motley, Director of United States Employment Service, Department of Labor; H. B. McCoy, Director of Office of Industry and Commerce, Department of Commerce; Edward J. Overby, Assistant to the Secretary, Department of Agriculture; Vernon D. Northrop, Administrative Assistant Secretary, Department of the Interior; Albert T. Kay, Chief, Manpower Division, Office of Manpower, Munitions Board; and Col. Percival S. Moses, Special Assistant to the Director, Selective Service System. J. Dewey Coates of the Labor Department's Bureau of Labor Security is secretary of the committee.

Meanwhile, the Interior Department is collaborating closely with this group in the development of a policy for adequate treatment of the mining industry's needs in the over-all manpower situation.

Efficient Maintenance

(*Continued from page 27*)

Portable substations are built complete, self-contained and ready for operation at the general service plant, and are trucked by trailer to the borehole location. There the substation is set on two previously constructed concrete piers and the necessary connections made. As mining conditions change and a new location is required, substation is disconnected, loaded on trailer and moved ahead to the new borehole. This move can be made during a normal working day.

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In addition to the above functions the maintenance department furnishes assistance to each operation, inside or outside, on problems of power, rebuilding equipment, procurement of new equipment, lubrication, construction of all types and other general maintenance problems. The duties of a good maintenance organization are many and varied; but an attempt has been made to highlight a few of its functions.

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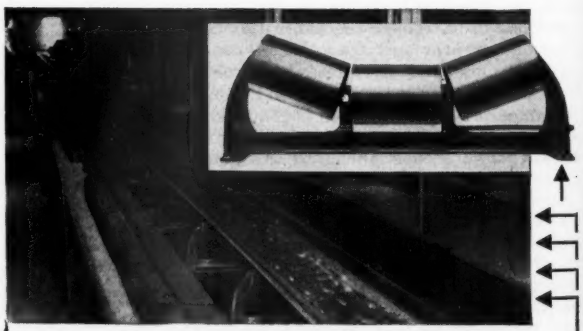

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GREASE-IN-DIRT-OUT SEAL prevents harmful matter from reaching bearings . . . ROLLS with smooth rounded-edge outer shell minimize belt wear . . . HIGH-GRADE ROLLER BEARINGS . . . INTERLOCKING NUTS AND YOKES prevent brackets from spreading under unusual impact . . . END BRACKETS of tough malleable iron in reinforced T-section withstand heavy loads . . . GREASE FITTINGS for rolls, protected within end bracket, provide easy, safe lubrication.

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Western States

Montana Chrome

D. F. Whittaker of Seattle, principal stockholder in the W & W Contracting Co., reported late in August that chromite deposits on the Boulder plateau of Montana are being further developed. The deposits in Sweet Grass County are next to the Taylor claims which the Federal government worked during World War II. W & W is developing massive veins and hopes the government will buy ore for stockpiling.

Gold Hunter Closes

The Gold Hunter silver-lead mine at Mullan, Idaho, which has been in almost continuous operation since its discovery in 1885, was closed indefinitely in August of this year. Ore was mined to the 1200-ft level until a fire destroyed the underground hoisting plant, since then leasers have operated in the upper workings. The mine has produced silver-lead ore which occurred in lens-like shoots throughout a mineralized zone 300 ft wide. The Federal company's Morning mine, believed to be the deepest silver-lead mine in the world, is on the same mineral zone system as the Hunter and is down to a depth of 4850 ft.

Victoria Copper Mine

Reactivation of the Victoria copper mine, shut down since 1946, was announced by A. E. Bernard, state inspector of mines for Nevada. He said development work was under way. The property is owned by Victoria Mines, and is under lease to the Anaconda Copper Mining Co.

Molybdenum Recovery

At its Morenci branch, Phelps-Dodge Corp. is conducting research and experimental work on the recovery of molybdenum from concentrates. Molybdenum exists in many of its copper deposits; at Miami Copper Co. approximately one pound of molybdenum is produced for every 200 lb of copper.

Sentinels of Safety Trophy to Union Pacific Coal Co.'s Reliance No. 7 mine is received by I. N. Bayless, left, president, Union Pacific Coal Co., from J. I. Horty, right, managing editor. Explosives Engineer: A. E. Stoddard, president, Union Pacific Railroad, looks on. A record of 386,750 man-hours without a lost-time accident won the trophy for the eleventh time in 17 years for a Union Pacific Coal Co. Mine

Bonanza Lead to Double Mill Capacity

The Bonanza Lead Co., operators of the Bonanza mine at Bossburg, Wash., and the Old Dominion mine at Colville, will double its present mill capacity, according to Earl D. Gibbs, managing director. Plans for a larger mill half a mile distant are in abeyance until 1951, or until the war situation clears enough so that milling equipment can be manufactured and delivered. The present mill will be expanded from 100 to 225 tons daily capacity with machinery at present on order.

At the Old Dominion crews have opened a tunnel started in 1883, but abandoned before it reached ore. The old tunnel has been driven 400 ft further south and has another 100 ft to go to reach the objective. It must also go some 1000 ft south to reach the Ella ore deposit. About 400 ft of that distance has been opened.

Previous operators dropped the Bonanza in the belief there was no more ore. Gibbs reports "more than $2,000,000 in lead and silver has been taken out in the last seven years," since they took over the property. Some ore has been milled there on a custom basis, but Gibbs doubts if this practice will continue. When the Old Dominion comes into production, it is expected that the two mines will run the mill at capacity.

AEC Drilling

An exploratory drilling program of the Atomic Energy Commission in the Marysvale, Utah, area is under way, an official recently announced. The first drill hole has been started to define the uranium bearing ore now being mined in that area. Scope of the program will depend upon developments as the work progresses. Work will be done by the U. S. Bureau of Mines under AEC supervision. Mapping preliminary to the drilling program is just about finished.

Central Eureka Mining Co.

Central Eureka Mining Co. has confirmed reports that the corporation plans to sink a winze from the company's shaft to facilitate developments of the main ledge at the 4200-ft level. Drifts will be extended at 150-ft intervals to the orebody being mined on the 3900-ft and higher levels. Cost of the projected winze is estimated at $100,000 by the management. Central Eureka is milling 150 tons of gold ore daily. President J. D. Swift reported recently that the company earned a profit of $70,000 to $75,000 for the first six months of 1950, compared with an operating loss approximating $145,000 in the first half of 1949. The company owns a large group of claims at Sutter Creek, Calif., including the Eureka mine. The company rehabilitated its properties after World War II at a cost exceeding $1,000,000.

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PARIS MANUFACTURING COMPANY

PARIS, ILLINOIS

Miami Copper Project

Three miles from Miami, Ariz., Copper Cities Mining Co., a subsidiary of the Miami Copper Co., has been carrying on exploratory work. An estimated 30,000,000 tons of low grade disseminated chalcocite ore which can be mined by open-pit methods, has been developed.

To strip and prepare the ore body and move the Castle Dome concentrator to the site from its present location eight miles away, requires an expenditure of $13,000,000. As the Castle Dome ore body is expected to be exhausted by 1954, the mill will then be available for the Copper Cities project which should be entering production stage at that time.

Perfect Safety Record

One of the nation's safest mines, the Keene No. 2 mine of the Bair Collins Co., Roundup, Mont., has produced 1000 tons of coal per day with from 50 to 60 men for a period of three years without a single lost-time accident.

Ione Encounters Blind Vein

The Ione Mining Co., in the Murray district of Idaho, reports cutting a "blind" vein system of silver-lead-zinc ore 12 ft wide in a lower tunnel development. The blind vein is about 100 ft from the estimated downward extension of the Ione vein, which is the tunnel objective.

Goldfield Consolidated Mines Reopens

Slightly more than a year after its shutdown the Goldfield Consolidated Mines, Inc., has reopened its Anderson mine at Leadpoint, Wash., and its Sierra zinc mill at the Blue Ridge mine on the Aladdin road. A company spokesman has said the Anderson open pit deposit is being mined with both draglines and shovels, and the ore is being trucked to the mill, which is operating at 200 tons a day capacity.

New Open Pit Mine in Nevada

New open pit operations were scheduled to start in August at the Kimberly, Nev., property by Consolidated Coppermines Corp. A. J. O'Conner, general manager, has announced stripping and mining of some 3,000,000 tons of ore adjacent to the Morris mine will be undertaken for the company by Isbell Construction Co. A large area has already been stripped. Eight tractors, four scrapers and a Diesel electric shovel will be used in full-scale operations, with 75 to 80 men employed, according to Frank Quilici, general superintendent for Isbell Construction Co. Ore will be shipped to the McGill smelter, operated near Ely, Nev., by Kennecott Copper Corp.

Nevada Tungsten

Nevada-Massachusetts Co. is concentrating 425 tons of tungsten ore daily at its scheelite properties in the Mill City area near Lovelock, Nev. The company employs 150 to 160 men and owns four developed mines at Tungsten near Mill City. The operation is said to be the largest of its type in the United States. The company started production at an early period in World War I and operated continuously until June 1949, when operations were halted by low price of the product. Activities were resumed in January. Demand for tungsten is expanding and higher prices are expected by producers as a result of the accelerated national defense program.

New Ventilating System

Polaris-Silver Summit Mining Co., in Coeur d'Alene District, Idaho is installing an underground air circulating system on the 3000-ft level. The system involves the driving of a 1400-ft crosscut tunnel and the installation of a 50,000-cfm exhaust fan which will pull air down the 3000-ft shaft, circulate it through the mine workings and exhaust it through the Silver Dollar shaft which was recently connected with the 3000 level.

California Antimony

Development of an antimony deposit continues in the high hill area of the Lone Tree district near Hollister, Calif. The property comprises 500 acres and was leased and optioned about a year ago from R. B. Knox by the Cordero Mining Co., a Sun Oil Co. subsidiary. S. H. Williston, vice-president of the company, said a few months ago that enough metal could be produced to meet operating costs, but that further tests and development must be completed to definitely establish financial success of the project.

Cordero Mining Co. located a solid ledge of low grade antimony by driving a tunnel 1220 ft into virgin country. Drilling was started lately by the U. S. Bureau of Mines to determine depth and dimensions of the ore body beneath the tunnel workings.

Butte Mines On Six Days

Beginning on September 11, employes of the Butte mines of the Anaconda Copper Mining Co. were placed on a six-day work week basis, it was announced by E. S. McGlone, vice-president in charge of western operations. The six-day work week would continue in effect as long as warranted. At the same time it was announced that to the extent practicable, the company's operations at the Anaconda smelter would progress toward a six-day week. The announcements were made following discussions with officers and local representatives of the International Mine, Mill and Smelter Workers in Butte and Anaconda.

Hypotheek Pushing West

Hypotheek Mining Co., Kellogg, Idaho, has purchased from the King of Pine Creek Co. a group of mining claims adjoining Hypotheek on the west. The company is now driving a drift west on the 900-ft level to find the Hypotheek vein across the fault which cut off an orebody.

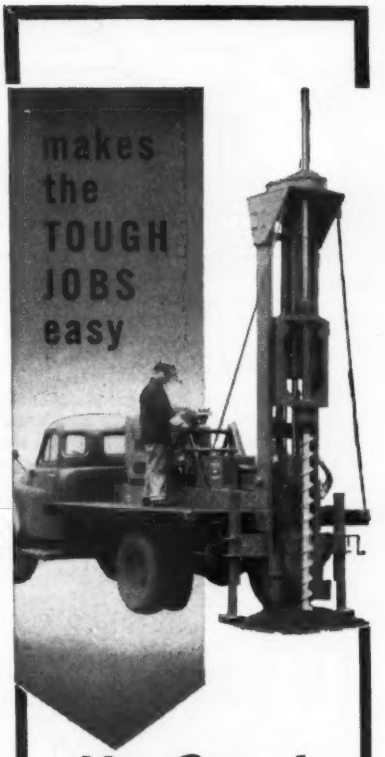
ACM Progress

Cornelius F. Kelley, chairman, board of directors, Anaconda Copper Mining Co., recently reviewed the three-year progress of the Greater Butte Project at a dinner in his honor sponsored by the Butte Development Association. He announced that over 20 miles of pipe had been installed, 13 miles of old workings have been reopened, many concrete bulkheads have been built, and 1,225,000 tons of tailings have been placed in formerly mined-out openings preparatory to mass mining the new project.

The Kelley shaft has been sunk to a depth of 587 ft and monolithic concrete lining installed to a depth of 315 ft. Haulageways have been advanced a total of 3200 ft. A 3000-hp hoist has been installed and a second hoist of 2250-hp is being moved to the shaft site. A steel headframe, 178 ft high, is being remodeled and widened to eventually support four hoisting sheaves. Work is under way on a modern two-story change house which will also contain storage facilities and mine offices.

Extensive remodeling of the Anaconda concentrator and smelter is being carried forward in preparations to treat the first Greater Butte Project ore scheduled to arrive in the spring of 1952.

Other progress includes remodeling of the Anaconda zinc concentrator to increase capacity from 2000 to 4800 tons of zinc ore daily. The phosphate plant at Anaconda has been enlarged and a new contact sulphuric acid plant added. Four electric furnaces have been placed in operation for the production of ferromanganese. A new 1,000,000 lb per month copper precipitating plant has been built to replace the old ones; the new plant can handle the entire flow of mine water, 30,000 tons per day. A long haulage tunnel with a length of over 6000 ft will be driven to give access to zinc ore bodies in the Lexington and Alice mines. In the field of housing, Mr. Kelley announced that the Butte Development Association had made unusual progress. Already the community has completed more than 400 new homes and 250 other residences are under construction.



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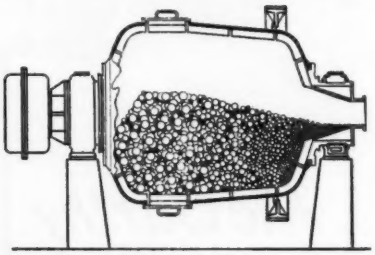
Manufacturers Forum

New Tricone Mill

For wet and dry grinding and pulverizing applications, the Hardinge Co., Inc., York, Pa., has announced its new "Tricone" ball mill with a slightly tapered shape which is said to keep the larger grinding balls at the feed end of the mill. The new unit is designed to incorporate all the good



features of the Conical mill and provide additional room for smaller grinding media at the discharge end.

Structurally the unit consists of a conical or convex feed head; a short cylindrical section; a long tapered conical section; and a wide angle conical or convex discharge head.

Advantages claimed for the new mill are proper ball segregation, maximum energy at the feed end, increased ball turbulence, maximum working volume for minimum liner surface, and less wear on discharge grate when used.

Loaded Wrench Signals User

"Proto" torque wrenches that may be set at the desired torque reading and signal the operator when the load point is reached are being produced by the Plomb Tool Co., Los Angeles. The operator may watch a pointer advance along the dial to load-limit point. When this point is reached a definite impulse is imparted to the hand and a loud click is sounded. The load-limit warning device is designed to be useful to prevent stripping or over-loading of roof bolts and all types of bolts.

Improved Crankcase Oil

The D-A Lubricant Co., Inc., Indianapolis, Ind., has announced development of an improved crankcase oil for Diesel and gasoline engines which is reported to be able to combat sludge and engine deposits under severe operating conditions, even when used with fuel containing up to 1 percent sulphur. Among the advantages claimed for the improved oil are: the prevention of rings sticking, valve and rocker arm deposits and excessive liner wear; cold engine sludge in stop-and-go operations; and rust and moisture corrosion in idle engines.

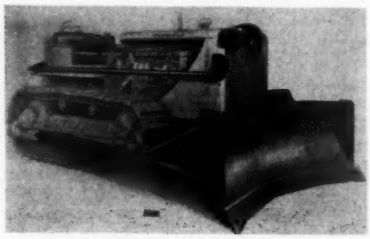
Who Knows—And What

A second edition of the biographical reference works "Who Knows—And What" is now being compiled. Those having special skills and knowledge in one or more of thousands of highly-specific topics, together with information on research and experience in these fields, are included in this useful volume. A locator index refers the user to persons having special knowledge on any one of the subjects included in the index.

To enable the publishers to make this book of the utmost value, the cooperation of the mining industry will be most helpful.

U-Shaped Bulldozer

A new, large capacity, U-shaped bulldozer, designed for universal use in a variety of earth-moving applications with the Caterpillar Diesel D8 track-type tractor, has been added to the heavy earth-moving equipment



line of Caterpillar Tractor Co., Peoria 8, Ill. The new design features minimum end spillage when bulldozing straight ahead and is claimed to be an excellent tool for stockpiling, handling large capacity loads and allowing good maneuverability.

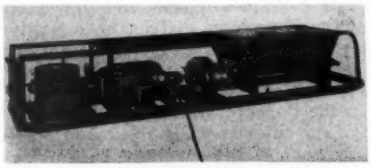
Cutting width of the blade is 11 ft 11 in. and it is 45¼ in. high.

Clothing Resists Chemicals

Industrial work garments made with "Vinyon" N yarn, a product of Union Carbide & Carbon Corp., is said to offer an unequal degree of resistance to destructive chemicals at industrial concentrations. Chem-Wear Corp., manufacturers of the clothing, state that the resistance of the clothing is inherent in the fiber and that, although not fireproof, Chem-Wear is fire-resistant and will not support combustion.

Mobile Rock Duster

A new rock duster designed to overcome the labor of moving a machine from room to room for rock dusting in low-roof mines is available from the American Mine Door Co., Canton, Ohio. The "Little Chief" unit is



equipped with a winch which will move the machine at the rate of 40 fpm regardless of height of roof or condition of floor. Ample power is provided to distribute a larger quantity of dust through 50-250 ft of 1¾ in. hose. The 3½-hp motor may be had dust-tight or U. S. Bureau of Mines approved, permissible with trolley tap or permissible running plug for use on shuttle car.

Wired Television

Called the "Utiliscope," wired television units are available from the Diamond Power Specialty Corp., Lancaster, Ohio. The system consists of a camera wired to a receiver to enable direct observation of an operation regardless of its location or accessibility. In an attractively illustrated brochure, the company depicts how coal-preparation operations may be subjected to closer control with reduced manpower by locating "utiliscopes" to bring pictures of coal cleaning operations to a central control point.

Power Distribution Fault Finder

The Mines Equipment division of Joy Mfg. Co. announces availability of a fault finder that permits rapid location of short circuits and open-type faults in cable. The new unit is battery operated and simple to operate. Further details describing this new product may be obtained upon reuest to department CF5, Mines Equipment division, 4235 Clayton Ave., St. Louis, Mo.

Fluid Energy Reduction

C. H. Wheeler Mfg. Co., Philadelphia, has announced production of a fluid energy reduction mill for the production of micron-sized particles. The unit operates by compressed gases, fed through jets. The gas is said to provide the motivating power for attrition of the particles against each other. It is claimed that this method enables reduction to minute sizes at low cost.

The Garrison Story

A new 20-minute, full-color, 16-mm sound film entitled "The Garrison Story" has been produced by the Euclid Road Machinery Co. and is available on request to the sales development department. This documentary film features the Garrison Dam, one of the largest earth-moving projects ever undertaken, and its part in the over-all development of the Missouri River Valley. Featured are flood and drought scenes which have repeatedly brought disaster to the Missouri Basin in the past. Various construction phases plus glimpses into the Missouri Valley of tomorrow are highlighted in the new film.

Rocker Jigs

The Dorr Company has acquired the Pan American jigs and is now supplying them as the Dorrco-Pan American Jigs. These jigs have had wide use in placer operations, in closed grinding circuits of gold mills, and on many applications where a coarse bed concentrate is separated from the gangue.

Low head room is required by the Dorrco-Pan American jigs. The two-cell units offer a balanced drive and are said to provide material power saving. The capacity per square foot of floor space is high as the jig screen area is nearly equal to the plan area of the machine.

Geiger Counter Sales Up

A report from the Radiac Co. of New York stated that sales of radioactivity detecting instruments are up 75 percent and inquiries have jumped 100 percent since the first of August, compared with a similar period in July. Although previous interests have originated from radiochemical laboratories, governmental agencies, schools, mine owners and amateur prospectors, current interest stems from a wide variety of people ranging from business executives through school teachers and office girls to mailmen and agents from friendly foreign governments.

No definite opinion has been advanced for the reason behind this spurt of sales and inquiries. However the situation parallels the extensive coverage given by the press and radio to the Atomic Energy Commission's book, "The Effects of Atomic Weapons."

Coal Heavy-Media Plant

Contract negotiations were recently completed with the Southwestern Engineering Co. by the Crystal Block Coal & Coke Co., of West Virginia, for a Heavy-Media Separation plant to be included in a completely new tipple now under construction. A factory-built plant will be part of the tipple at the company's No. 3 mine operating on the Pond Creek seam. The washing problem presented by this coal is solved by the ability of the separation plant to produce a middling product. The unit has a feed capacity of 200 tons per hour.

—*Announcements*—

M. W. Heinritz, formerly vice-president, **Gould Storage Battery Corp.**, was elected vice-president in charge of industrial sales, **Gould-National Batteries, Inc.**

James B. Weaver has been appointed techno-economist in the commercial evaluation department of **Olin Industries, Inc.**, the parent company of Western Cartridge Co. and the Winchester Repeating Arms Co.

Robert D. Allison, former purchasing agent for Whiteman division of **National Mine Service Co.**, has been appointed general purchasing agent for all divisions of the company.

W. H. Schneider has been elected vice-president-comptroller of **Mack Trucks, Inc.**, succeeding **J. E. Savacool**, who is retiring. Mr. Schneider was also elected a member of the board of directors.

M. W. Sledge has been named to replace the late E. W. Stephens as manager, belt sales department, **Goodyear Tire & Rubber Co.**

The Koehring Co. of Milwaukee recently announced the appointment of **Construction Equipment Co.** as its new distributor in the state of Alabama and northwestern Florida. **Sioux Road Equipment, Inc.**, Sioux Falls, S. Dak., will handle the Koehring line in that area. The **Tom W. Carpenter Equipment Co., Inc.**, Amarillo, Tex., will handle the Koehring line in western Texas.

Myron M. Reiss, former chief, scientific liaison, U. S. Atomic Energy Commission, now heads the **Atomic Center**, a New York concern serving in the field of nucleonics. **The Radiac Co.** and **Atomlab** are divisions of the Atomic Center.

Edward Daley, former San Francisco district manager for Marion Power Shovel Co., has been appointed assistant regional manager for the **Cummins Engine Co. Burton C. Sears** has been named assistant regional manager for the southeastern region of the company.

All directors of the **American Car & Foundry Co.** were reelected at the annual meeting of stockholders. Two new vice-presidents, **James F. Clark** and **Phillips B. Hoyt**, were elected.

CATALOGS AND BULLETINS

HARD TIPPED ROCK BITS. *Kennametal Inc., Latrobe, Pa.* A 24-page catalog describes the complete line of Kennametal's cemented carbide bits for cutting and drilling coal and rock. Nearly 30 different tools are covered and fully illustrated. Performance data is included and manufacturing facilities are discussed. Ask for catalog M-6.

MATERIAL LOADING. *The Eimco Corporation, 634-666 South Fourth West Street, Salt Lake City 8*, in bulletin No. 1021, Eimco 104 RockerShovel, describes a caterpillar-mounted, self-propelled 1¾-2-cu yd Eimco RockerShovel for use in sand and gravel, or other small size broken material.

SURFACE MINING. *Caterpiller Tractor Co., Peoria 8, Ill.* Form No. 12987 describes the use of Caterpiller equipment in copper mining in Arizona; coal stripping in Kentucky, Alabama and Canada; shot-hole drilling in an Illinois quarry; hauling of aggregate in California; and a Hystaway dragline stripping for pit run gravel in Iowa.

TIMBER PRESERVATION. *Osmose Wood Preserving Co., Inc., 1437 Bailey Ave., Buffalo 12, N. Y.* Anyone interested in making wood last longer will be interested in a booklet outlining the advantages of Osmosalts. According to this booklet wood preservation can be accomplished with unskilled labor, without expensive equipment and without rupturing any species of wood. Other advantages claimed are cleanliness, no irritating fumes, no offensive odor and fire proofing. Copies of this booklet will be sent on request.

VOICE POWERED MASKFONE. *Mine Safety Appliances Co., Pittsburgh 8, Pa.* Designed to permit the transmission of orders to individuals on the job and relaying immediate reports on job conditions in toxic atmospheres, the M-S-A Maskfone is powered by the speaker's voice and requires no batteries or other external power sources. The complete M-S-A Maskfone assembly, including transmitter, earphones with head harness, hand set, and 125 ft of cable on a revolving reel is approved by the U. S. Bureau of Mines for use with the M-S-A Chemox oxygen breathing apparatus, demand oxygen or air apparatus, canister gas masks, and hose masks. The unit is illustrated and described in detail in Bulletin No. B-21, available on request from Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.

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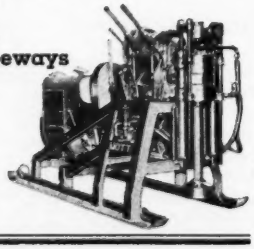

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FOR *CLEAN* AND
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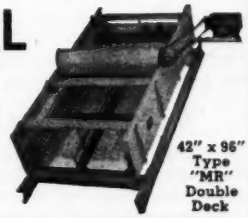

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EUCLID

STANDARD EQUIPMENT *for* OFF-THE-HIGHWAY HAULING JOBS!

Leading contractors and industrial users of heavy earth moving equipment have standardized on Euclids because they know from experience that "Eucs" increase profits and cut hauling costs. "Euclids sure do the job . . . actually cost less to own than any other hauling equipment," owners say.

Large capacity, dependable performance, and lower operating and maintenance costs have made Euclid the choice for off-the-highway hauling jobs. Designed for a wide range of work, there are models for handling all types of material efficiently . . . earth, coal, ore, rock, and other heavy excavation.

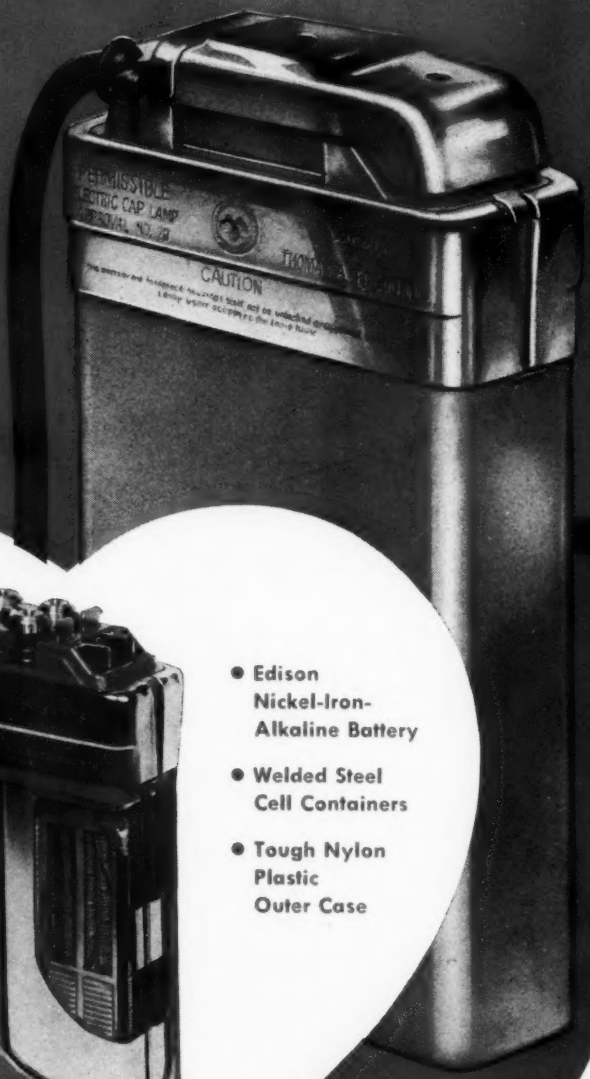
Rear-Dump Euclids range in capacity from 10 to 34 tons and are available with standard or quarry bodies . . . semi-rigid or spring mounted drive axles . . . diesel engines from 125 to 300 h.p. Bottom-Dump models have capacities of 13 to 50 cu. yds., 20 to 40 tons, with diesel engines to 275 h.p.

The parts and service facilities of Euclid's world-wide distributor organization assure prompt, efficient service to all Euclid owners. Write today for complete information on the Euclid line or call your distributor for an estimate on your present or future jobs.

THE EUCLID ROAD MACHINERY CO., CLEVELAND 17, OHIO

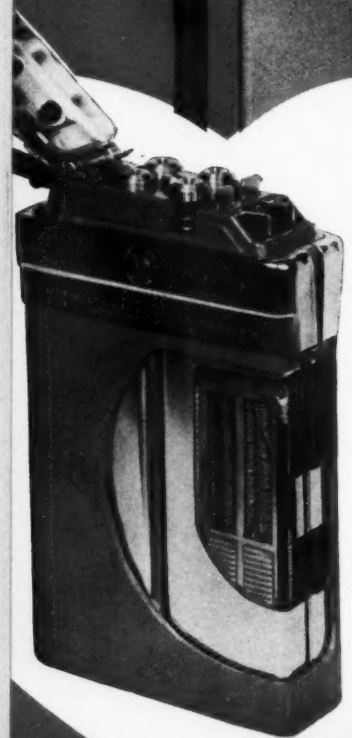
...the heart of Better Light for the miner

THE FAMOUS *Edison* BATTERY



The unfailing dependability of the Edison Electric Cap Lamp battery has been recognized since its introduction to the mining industry thirty-five years ago. Today, the Edison nickel-iron-alkaline battery continues to lead in every detail of construction and performance.

More light than ever before obtainable in a miner's lamp is a feature of the new Edison R-4 Battery. Cased in tough nylon plastic, with outer parts of stainless steel, the R-4 Battery is armored against rough usage. It is compact, well-balanced and easy to wear. *May we arrange an underground demonstration?*



- Edison Nickel-Iron-Alkaline Battery
- Welded Steel Cell Containers
- Tough Nylon Plastic Outer Case

- Two-Filament Bulb
- Positive "Spot" Adjustment

EDISON MODEL **R-4** ELECTRIC CAP LAMP

APPROVED BY U. S. BUREAU OF MINES

MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS . . . . . PITTSBURGH 8, PA.

At Your Service: 48 BRANCH OFFICES in the UNITED STATES

MSA SAFETY EQUIPMENT HEADQUARTERS

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